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# Strategies for Implementation of Electronic Health Records

Carlene Vassell-Webb  
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# Walden University

College of Management and Technology

This is to certify that the doctoral study by

Carlene Vassell-Webb

has been found to be complete and satisfactory in all respects,  
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Walden University  
2019

Abstract

Strategies for Implementation of Electronic Health Records

by

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MBA, International College of the Cayman Islands, 2010

BSN, Jacksonville University, 2006

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Walden University

June 2019

## Abstract

Implementation of electronic health records (EHRs) is a driver for the improvement of health care and the reduction of health care costs. Developing countries face substantial challenges in adopting EHRs. The complex adaptive system conceptual framework was used to guide this single case study to explore strategies that health care leaders used to successfully implement the EHR system. Data were collected from 6 health care leaders from an island in the Caribbean using a semistructured interview technique. Data were analyzed using the Bengtsson's 4-stage data analysis process, which includes decontextualization, recontextualization, categorization, and compilation. The results of the study yielded 5 main themes: training, increased staffing, monitoring, identifying organizational gaps, and time. The implications of the study for positive social change include the potential to improve the standards of care provided to promote improved patient outcomes by using the strategies identified in this study to successfully implement the EHR system.

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## Dedication

Obtaining knowledge is a life-long journey requiring at times just the use of sensory skills but other times hard work, determination and dedication to succeed. I dedicate this success story to my great grandmother who didn't have the luxury of an education but taught me the life skills necessary to take on any challenge and succeed including determination, courage, strength, patience, humility and most of all belief in self. I wish she was here to celebrate this milestone with me, but I know she must be looking down at this moment smiling and being as proud as she can be. This DBA journey has been challenging but successful completion was achieved through the encouragement and support of my family. My husband who was there for every small victories and progress as well as the frustrations. Thank you, Hun for being my number one fan! My children. You inspire me to live by example. My Sunday Dinner Crew! You helped me to slow down and breathe through this process! Thank you for your love and support during this journey.

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Special thanks to my research partner and participants. Without their contribution I could not have completed this process. Thanks to all my family and friends who provided encouragement and support throughout my journey. Finally, I would like to thank my special friend who persuaded me to start this journey and didn't accept any of my excuses why I couldn't commence the DBA program and who provided support and prayers along the way.

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## Section 1: Foundation of the Study

The burden of health care costs and concerns of increased medical errors initiated a catalyst for improvement in the delivery of health care in the United States (Agha, 2014). Researchers highlighted the value-based approach to health care delivery achievable from analytics and availability of high-volume patient data collected using health information technology (HIT) such as the electronic health record (EHR) systems (Bates, Saria, Ohno-Machado, Shah, & Escobar, 2014). The recognition of the value of EHR to the improvements in health care delivery resulted in the U.S. Government contributing significant financial incentives to promote adoption and implementation of the EHR system (Weeks, Keeney, Evans, Moore, & Conrad, 2014). The overarching goals of EHR include increase efficiency in the delivery of care, improvement in the quality and safety of care, improvement in the coordination of care, and increased access to patient information to promote patient participation in decisions about their health (Centers for Medicare and Medicaid Services [CMS], 2018; Williams, Shah, Leider, & Gupta, 2017). While developed countries promote and facilitate the implementation of EHR to improve health care delivery outcomes and reduce health care cost, developing countries face significant challenges in the implementation of EHR.

### **Background of the Problem**

Rising health care cost in the United States led to the U.S. Government's investment in HIT to promote the wide-spread adoption of EHR (Furukawa et al., 2014; Obama, 2016). Increase health care spending projection ranked at an average rate of 5.8% annually between 2014 and 2024, 1.1% greater than the growth of the gross domestic

product (CMS, 2014). Health care costs to U.S. citizens far surpass that of other countries, yet Americans experience poorer outcomes (Broadwater-Hollifield et al., 2014). In 2009, the U.S. Government authorized \$28 billion in financial incentives through the HIT for Economic and Clinical Health (HITECH) Act of 2009 (Dranove, Garthwaite, Li, & Ody, 2015).

The intent of the HITECH Act included facilitating the adoption and implementation of the technological advancements such as the EHR system in eligible health care facilities (Cohen, 2016) to promote the reduction in health care costs (CMS, 2014). The government established the meaningful use (MU) criteria to evaluate compliance of health care organizations with the implementation process of EHR and promote improvement in the quality and outcome of health care (CMS, 2015). The adoption rate of EHR systems increased since the authorization of the financial incentives (Wright, Feblowitz, Samal, McCoy, & Sittig, 2014). Fifty-nine percent of U.S. hospitals adopted the minimum basic EHR system in 2013 (Office of the National Coordinator for HIT [ONCHIT], 2014) and office-based settings also reflected steady growth in EHR adoption since 2009 (Furukawa et al., 2014). Despite this progress, some hospitals lagged behind in the implementation process of EHR to reduce health care cost. Low- and middle-income countries also experienced rising health care cost due to increase in economic development, increase longevity, and increase patient demand for health care services (Jakovjevic & Getzen, 2016).

### **Problem Statement**

Implementation and adoption of EHR as an initiative to reduce health care costs remain unattainable for many health care organizations (Dranove et al., 2015). EHR adoption trends reflected an implementation rate of 75% of hospitals implementing the basic EHR system, indicating a lag in the EHR implementation process for some hospitals (Adler-Milstein, DesRoches, et al., 2015). The general business problem is healthcare leaders who did not adopt EHRs missed out on the opportunity to realize the financial benefits of the EHR system. The specific business problem is some healthcare leaders lack the strategies to implement EHR systems to reduce healthcare costs.

### **Purpose Statement**

The purpose of this qualitative single case study was to explore strategies health care leaders use to implement EHR systems to reduce health care costs. The population consisted of six health care leaders from one hospital located in an island in the Caribbean who successfully implemented the EHR system. The implication for social change includes the potential to provide new insight to hospital leaders who need to implement the EHR system while contributing to the opportunity for increased efficiency and promoting better patient outcomes. Achieving better patient outcomes could improve the overall population health, foster a healthier workforce, and contribute to the reduction in health care costs.

### **Nature of the Study**

I used the qualitative research method for this study using techniques such as interviews and document reviews to collect data from participants with different

meanings, perceptions, and interpretations to understand the meaning of the EHR implementation process. Qualitative research facilitates an inductive approach, enabling researchers to employ open-ended questions of inquiry to identify and understand the research phenomenon as experienced by the participants (Yin, 2014). Qualitative researchers share a constructivist worldview in which the researcher explores the subjective and real-life experiences to understand and interpret the meaning of the data (Lub, 2015). Researchers using a constructivist approach seeks to construct knowledge rather than discover knowledge (Probst, 2015).

In contrast, quantitative researchers share a postpositivist assumption, which involves a worldview associated with the experimental cause-and-effect relationship and hypotheses testing to examine correlations and differences among variables (Guba & Lincoln, 1994; Lenzholzer & Brown, 2016). Researchers employing a quantitative methodology use numerical data analyzed mathematically and rely on statistical inferences to explain the research phenomenon (Ketokivi & Choi, 2014). Quantitative inquirers share an objectivist or positivist worldview determined by existing theories and the application of experimental methods of examining the research phenomenon (Lub, 2015; Sousa, 2014).

I conducted an inductive inquiry to explore the research phenomenon as I did not require the use of experimental methods for this research. The mixed method includes both a quantitative and qualitative component (Yin, 2014). I used the mixed method approach for this study as the quantitative portion is not necessary for conducting this research. A qualitative methodology was appropriate for exploration of strategies and



processes to implement EHR systems because I was exploring a phenomenon and not examining relationships among variables.

I selected the single case study design to conduct this study for the exploration of the research question and understanding of the EHR implementation strategies and processes in a single hospital, using multiple data collection techniques. Researchers use case study design to develop a deep understanding of real-life events such as organizational and managerial strategies and processes (Yin, 2014).

Other research designs considered include ethnography and phenomenological designs. Researchers using the ethnography design conduct extended periods of detailed field observations and interviews to explore cultures (Yin, 2014). This study did not include an exploration of organizational culture. In a phenomenological design, the researcher seeks to understand how a phenomenon is experienced and perceived psychologically by different participants (Sousa, 2014). I did not explore lived experiences of a particular population, so a phenomenological design was not appropriate. The main advantage of using a case study design relates to the ability of the researcher to gather data from multiple sources such as observation, interviews, documentation, and archival records (Yin, 2014) to explore the EHR implementation process. Hyett, Kenny, and Dickson-Swift (2014) also noted case studies are flexible and designed to suit the case and the research question under investigation. I used a case study design for this research because the case study design was appropriate for gathering in-depth information on the strategies health care leaders use to implement the EHR system to reduce health care costs.

### **Research Question**

What strategies do health care leaders use to implement EHR systems to reduce health care costs?

### **Interview Questions**

1. What strategies did you use to successfully implement the EHR system?
2. What strategies did you use in identifying staff training needs and developing staff training programs to promote successful implementation of your EHR system?
3. What strategic role did the information technology (IT) staff play in the successful implementation of your EHR program?
4. What strategies did you use during the EHR implementation process to support user compliance with the change in the documentation requirements for the EHR system?
5. What strategic measures did you include during the implementation process to ensure patient safety and confidentiality in the use of your EHR system?
6. What are some of the challenges or barriers you encountered during the implementation of the strategies and processes of the EHR system?
7. How do you assess the effectiveness of the strategies for implementing your EHR system?

### **Conceptual Framework**

I used the complex adaptive system (CAS) as the conceptual framework to guide this research. The CAS relates to a group of components typically acting in unpredictable

and nonlinear ways and make up the whole organization through a network of interactive and interconnected processes of a complex system (Ekboir, Canto, & Sette, 2017; Sturmberg, Martin, & Katerndahl, 2014). The CAS theory originated from biological systems in which agents interact and self-organize and emerge as an interdependent complex system (Kauffman & The Santa Fe Institute, 1993; Reynolds, 1987; Welsh, 2014). The CAS facilitates an understanding of the components of systems, the interactive nature of these components, and how these systems change and adapt in the course of time (Lorden, Zhang, Lin, & Cote, 2014).

Complex systems such as health care organizations comprised of unpredictable and interdependent relationships with nonlinear responses and commonly occurring variations in norms (Abbott, Foster, de Fatima Marind, & Dykes, 2014) and the ability to self-organize, adapt, and evolve with their environment (Wang, Han, & Yang, 2015). Khan et al. (2018) noted individuals operating in a complex system, as in health care organizations, transform through adaptation. Health care systems comprised of several interconnected elements including multiple health care professionals, employees, patients, hospital infrastructure, technology, business processes, treatment modalities, and organizational culture (Chandler, Rycroft-Malone, Hawkes, & Noyes, 2016). Complex systems consist of many different players with many different needs and unique interest. (Flieger, 2017; Mason, Mayer, Chien, & Monestime, 2017).

Thus, the complexity relates to the degree of diversity (Chiva, Ghauri, & Alegre, 2014) and the unpredictable and emergent pattern of complex systems contribute to variations in outcomes (Kitson et al., 2018). The complexity of the health care system

necessitates an examination of the forces that affect change. In implementing health information system (HIS), health care leaders face the challenge of linking clinical practice with technological expertise and require a focus on the interaction between the organizational stakeholders and the technology (Sligo, Gauld, Roberts, & Villa, 2017). The efficiency and effectiveness in catalyzing the necessary changes for implementing technological systems depend on an understanding of the interrelatedness of the organizational components (Sligo et al., 2017).

### **Operational Definitions**

*Complex adaptive system:* The CAS relates to a group of components often acting in unpredictable and nonlinear ways without external supervisory influences and comprised of a network of interactive, interconnected process of a complex system (Sturmberg et al., 2014).

*Electronic health record:* EHR refer to a computer-based, method of documenting, and storing patient records and clinical workflows in real-time making patient information available immediately and securely to users of the patient records (Hydari, Telang, & Marella, 2015).

*Health information exchange (HIE):* The term *HIE* refers to electronically accessing and sharing patient clinical information among health care professionals who provide care for the patient (Rudin, Motala, Goldzweig, & Shekelle, 2014).

*HIT:* *HIT* is a term used to describe technology used by health care workers and providers and includes components such as the EHR (HealthIT.gov15).

*Health information technology for economic and clinical health* (HITECH): The *HITECH Act* refers to the legislation authorizing the HHS to establish programs to promote improvement in the safety, quality, and efficiency of health care delivery through the adoption of HIT such as EHR and HIE (HealthIT.gov, 2016).

MU: *MU* refers to providers meeting a series of criteria with the use of EHR such as improving the safety, efficiency, and quality of patient care; promoting coordination of care; improving population health; maintaining the security and privacy of patient information; and promoting patient engagement (CMS, 2018).

### **Assumptions, Limitations, and Delimitations**

#### **Assumptions**

Establishing research assumptions refers to acknowledging what the researcher accepts as true in the absence of proven theoretical evidence (Schoenung & Dikova, 2016). The researcher's beliefs and assumptions play a role in determining the type of study the researcher undertakes; and the choice of research methodology, which affects the scope of inquiries and the results of the study (Kirkwood & Price, 2013). The first assumption of this researcher was that I would be able to access data.

Access to data is crucial to the researcher in making any meaningful conclusions about the research phenomenon (Ellis & Levy, 2009). Another assumption was the participants would be willing to participate in the study and would be knowledgeable about the EHR implementation process. Third, I assumed the information provided by the participants would be accurate and relevant to answering the research question. Finally, I assumed the sample selection was adequate for obtaining the necessary data to answer the

research question. A critical element in creating credible research necessitates the selection of an appropriate sample size to ensure adequacy of the data for analysis and interpretation of the findings (Fusch & Ness, 2015).

### **Limitations**

Identifying limitations of the study refers to recognizing and documenting threats outside the researcher's control that jeopardize the study's validity (Ellis & Levy, 2009). Researchers highlighted the importance of identifying limitations, noting documenting the limitations of the study highlights any weaknesses of the research and the effects of these weaknesses on the interpretation and validity of the research findings (Page, 2016; Thygesen, & Ersboll, 2014). Noble and Smith (2014) noted identifying biases, and outlining the limitations is an ethical responsibility of the researcher and facilitate evaluation and critique of the findings. Potential limitations of this study could relate to the sample size of the study. A small sample size could limit the generalizability of the research findings.

### **Delimitations**

Delimitations of the study relate to controlling the scope of the study (Ellis & Levy, 2009). The delimitations of a study allow the researcher to constrain the scope of the research into a more manageable study and enable the reader to understand the boundaries of the study (Ellis & Levy, 2009). The participants in this study were limited to health care leaders who had experience in the implementation of the EHR system. The study included an exploration of the strategies the participants used to implement EHR in one hospital in an island in the Caribbean Islands. Health care institutions excluded from

the study included home health organizations, ambulatory care facilities, and providers. Exclusion of these entities as well as limiting the study to one hospital in an island in the Caribbean, prevent generalizability of the research findings to other health care organizations or providers in different regions.

### **Significance of the Study**

The implementation of EHR facilitates the needs of many stakeholders in the health care arena including doctors, patients, clinical staff, insurance companies, and policy makers (Aminpour, Sadoughi, & Ahamdi, 2014). Adoption of EHR could have a significant effect on improvement in patient safety and quality (Meeks et al., 2014). EHR systems enable quick and easy access of patient data and improve communication between health care providers, institutions, and patients, which could lead to easier workflow and the prevention of errors (Pinho, Beirao, Patricio, & Fisk, 2014). Health care professionals can use the tools available through the EHR system to monitor patient's health and provide prompt intervention when necessary (Gordon, Leiman, Deland, & Pardes, 2014). Organizations facing challenges in the implementation process could use the information from the research findings to gain insight into managing or mitigating difficulties arising during the implementation or process change.

### **Contribution to Business Practice**

The results of the study could provide insights into strategies health care leaders could use to manage the implementation of the EHR system. Implementation of the EHR system promotes organizational compliance with government regulations. Noncompliance can result in financial penalties from the government in the form of

reduced reimbursement for health care services rendered (Centers for Disease Control and Prevention [CDC], 2016; CMS, 2015). Using EHR systems positively effects organizational efficiencies, process quality, decision support capabilities, and promotes conformance to evidence-based and the potential for identifying improved practice guidelines (Bardhan & Thouin, 2013). Exploring the strategies health care leaders use to implement the EHR system could contribute to the expansion of the implementation process to other hospitals.

### **Implications for Social Change**

Implementation of the EHR system can facilitate health information exchange for catalyzing the sharing of clinical information and coordination of patient care among providers, which could result in improved quality care to people in the community (Krist et al., 2014; ONCHIT, 2014). Physicians who use EHR achieved efficiency in clinical workflow and improvement in patient safety, contributing to prevention in medical errors and enhanced patient care (King, Patel, Jamoom, & Furukawa, 2014). Eighty-two percent of physicians who use EHR systems reported improvement in the quality of clinical decisions, 86% reported reduction in medication errors, and another 85% reported improvements in preventative care (Bardhan & Thouin, 2013). Implementing EHR systems could facilitate patient access to clinical information, thus improving the transparency and delivery of care (Turvey et al., 2014). Contribution to positive social change also include the use of the research findings by health care leaders to aid in the adoption and implementation of EHR, which could enable improvement in clinical efficiency and promotion of better patient outcomes. Achieving better patient outcomes



could promote overall local populations' health, foster a healthier workforce, and contribute to the reduction in health care costs.

### **A Review of the Professional and Academic Literature**

The main goal of this study is to explore what strategies health care leaders use to implement EHR systems to reduce health care costs. The purpose of the literature review was to gain an understanding of the complexity involved in EHR implementation and proven strategies to the successful implementation and adoption of EHR. The literature review also included information on the conceptual framework, CAS, used to guide this study. This research relates to the CAS framework because of the complexity of enacting change in the health care environment. The health care environment is a complex system requiring multidisciplinary interactions and interconnectedness for the system to function as a whole (Birchera & Kuruvilla, 2014).

The primary academic sources supporting this literature review included peer-reviewed journal articles; books; government reports and statutes obtained from government websites, and other institutional reports accessed through the Google search engine. The total number of references used consisted of 328 articles with 95% reflected peer-reviewed articles. The remaining 5% reflected books and other institutional reports and proceedings. The main academic databases used included ABI/INFORM Collection, Business Source Complete, CINAHL Plus, Emerald Management, Medline, ProQuest, Sage Premier, and ScienceDirect.

Keywords used in the literature review search included *electronic health records*, *HIT*, *health information exchange*, *HIT for Economic and Clinical Health*, *MU*, and

*complex adaptive system*. The literature review included an exploration of the background of EHR and the factors contributing to health care costs. Additionally, the literature review reflected a discussion of the progress of EHR implementation, the benefits and disadvantages of EHR adoption, as well as the challenges associated with the implementation of EHR systems.

### **Complex Adaptive Systems Framework**

CAS relate to a diverse, interconnected group of agents, or individuals with various attributes and behaviors, interacting and influencing each other in a nonlinear way to perform the objectives of the system (Lorden et al., 2014; Sturmberg et al., 2014). CAS is an incorporation of complexity theory and natural and social science theory and originated from biological systems in which agents interact to self-organize and emerge as a complex system (Welsh, 2014). The degree and number of relationships between components contribute to the complexity of the system (Ekboir et al., 2017; Larkin, Swanson, Fuller, & Cortese, 2014).

The increased complexity within a system results in a greater number of components and interrelatedness between components (Kannampallil et al., 2011) with individual agents functioning at various levels and in different capacities, resulting in an interdependency among agents (Begun & Thygeson, 2015; Reiman, Rollenhagen, Pietikainen, & Heikkila, 2015). The health care system consists of multiple interdependent stakeholders, each interacting and evolving in nonlinear ways (Kuziemy, 2016), requiring constant adaptation to the changes in the health care environment and an understanding of the complexity of the system (Larkin et al., 2014).

Neely (2015) noted the usefulness of the CAS framework in understanding evolving context. Cresswell and Sheikh (2013) identified factors affecting the implementation of HIT such as human factors considerations including social, technical, and organizational issues. Any changes within the health care system require an examination of the forces that affects change.

In exploring implementation success factors for improvement in quality and safety of care, Braithwaite, Marks, and Taylor (2014) highlighted the challenges of implementing changes in health care due to the complex and dynamic nature in which health care operates, noting implementation success occurs in distinct phases. This research relates to the CAS framework because of the complexity of enacting change in the health care environment. Birchera and Kuruvilla (2014) also noted the complexity of the health care environment highlighting the interconnectedness and multidisciplinary interactions required for the system to function as a whole. The degree of uncertainty in the delivery of health care including patients' condition, can result in constant changes in the health care system requiring effective response to change (Provost, Lanham, Leykum, McDaniel Jr., & Pugh, 2015). Abbott et al. (2014) noted the difficult and disruptive nature of implementing changes in the complex health care environment and recommended the use of the complex framework to guide the health IT implementation process.

Lanham et al. (2014) explored the differences in how individual physicians used the EHR system, using complexity science to analyze and interpret physician's perception of uncertainty, and physician's view of the role information plays in managing

uncertainty in the care of patients. In implementing HIT, health care leaders face the challenge of linking clinical practice with the technological expertise and require a focus on the interaction between the organizational stakeholders and the technology (Creswell & Sheikh, 2013). Ben-Assuli (2015) highlighted the complexity of studying the effects of HIE on patient care due to the complicated nature of care quality and the health care workflow context.

Patient care occur at many levels requiring several work systems and coordination of efforts, which can result in patient safety concerns across this complex network of systems with adapting and interacting elements (Carayon, 2014). Understanding the inter-relatedness of the organizational components deems relevant to the emergence of technological system changes (Creswell & Sheikh, 2013), and the complexity necessitates the development of strategic planning to ensure successful implementation (Boonstra, Versluis, & Vos, 2014). Using the CAS framework to identify patterns and themes from the data collected can facilitate understanding of the EHR implementation process and aid in answering the research question. Researchers can also use other theories to guide research studies on the implementation of EHR.

Research showed despite the progress seen in the implementation of HIT applications including EHR, fewer hospitals had adopted other advanced capabilities of the EHR including health information exchange, which facilitates sharing of patient information and patient access to electronic health information (Gabriel, Jones, Samy, & King, 2014). Drawbacks relating to the use of technologies, particularly EHR implementation were identified including workflow disruption, encouraging

workarounds, and exposure to new risks (Meeks et al., 2014). Other challenges encountered by some health care organizations to fully implement EHR include factors such as implementation cost, staffing, and technical challenges (Gabriel et al., 2014). An examination of the implementation process of EHR through the lens of other theories could promote understanding and use of the system. Researchers noted using the sociotechnical theory facilitates effective collaboration among all users (Cucciniello, Lapsley, Nasi, & Pagliari, 2015; Darko-Yawson & Ellingsen, 2016).

The sociotechnical theory originated from the work of the UK Tavistock Institute's researchers during the 1950s (Mumford, 2006). The Tavistock researchers believed promotion of knowledge should include improvement in the working environment, and this view led to the development of the sociotechnical theory (Mumford, 2006). The tenet of the sociotechnical theory relates to the notion that systems comprised of people, tools, and conversation thus, organizational and technological systems function cohesively and interdependently (Darko-Yawson & Ellingsen, 2016; Klein, 2014). The focus of the sociotechnical system relates to people and working relationship (Berg, 1999). Berg noted the health care system includes an interrelatedness of people, systems, equipment, and processes carrying out the delivery of care, and any change in one element affects the whole system.

Booth, Sinclair, Brennan, and Strudwick (2017) used the sociotechnical theory in exploring electronic medication administration record for understanding education curricula, highlighting the complexity of the relationships in the health care environment including the social and technological components. Casella, Mills, and Usher (2014)

explored the use of sociotechnical theory in nursing, noting a sociotechnical approach could facilitate workplace balance and promote optimal performance. Waterson (2014) emphasized the issues relating to poorly designed technologies including the potential for medical errors, highlighting the importance of considering human factors in the form of sociotechnical requirements when designing HIT systems.

Cucciniello et al. (2015) pointed out sociotechnical perspective could explain the interaction of actors and technology. However, Davis, Challenger, Jayewardene, and Clegg (2014) argued the focus of sociotechnical theory remains narrow pointing out researchers should broaden the scope of the sociotechnical theory to focus on the broader complex organizational system. I chose the CAS framework to guide this study. The CAS framework facilitates an understanding of the evolving context in which health care functions and the interrelatedness and connectedness of all components and interdependent agents operating within the complex health care environment (Kuziemy, 2016; Neely, 2015).

### **Historical Overview of Electronic Health Records and Health Care Cost**

This section presents a background of the concerns relating to rising health care costs, the trend in health care spending, and the projection of future health care expenditure. In addition, this section presents a discussion of the major issues related to the implementation of EHR that have shown to be likely contributors to the dynamic changes in the health care environment that adds to the complexity of health care delivery including the introduction of the ACA, changes in the Medicare and Medicaid reimbursement program, and changes in the insurance market. This section also

highlights the contributing factors leading to the U.S. Government's decision to initiate a widespread adoption of EHR including the effects of increased medical errors.

The increase in preventable medical errors presented in the Institute of Medicine's (IOM) report, triggered the recommendations to establish patient safety organizations and programs to improve patient safety and reduce medical errors (IOM, 1999; James, 2013). The success of such safety organizations and programs required the collection of patient data (Elkin, Johnson, Callahan, & Classen, 2016). Singh and Sittig (2015) noted organizations could harness the wealth of health information available through HIT and EHR to implement strategies to prevent medical errors. The mandate for the adoption of the EHR came because of the need to support health care delivery (Adler-Milstein et al., 2014) and reduce the rising health care costs (CMS, 2014). The HITECH Act was signed into law in 2009 to facilitate the adoption of EHR systems to promote the reduction of medical errors and lower health care costs (ONCHIT, 2014; Washington, DeSalvo, Mostashari, & Blumenthal, 2017). Research indicates some slowing of health care spending, which might not continue, as historically, health care spending growth reflects a link to the GDP (Squires, 2014). Keehan et al. (2015) projected a rebound in health care cost during the period 2016 to 2018, leading to faster growth in projected health care spending trend.

### **Health care cost and Contributing Factors**

In 2009, The U. S. health care expenditure ranked at approximately 18% of the gross domestic product (GDP) with an expected increase up to 34% by 2040 (Executive Office of the President, 2009) raising concerns for the U.S. Government. The health share

of the GDP is expected to increase up to 19.3% by 2023 (Sisko et al., 2014). Increased projection in health care spending reflected an average rate of 5.8% annually between 2015 and 2025, a rate of 1.3% greater than the growth of the gross domestic product (CMS, 2014). The projection of government-financed health spending ranks at 47% of the National health spending by 2024, to reach a total of \$2.5 trillion, an increase from 43% in 2013 (Kehan et al., 2015).

Initiatives such as the ACA had a noticeable effect on those entities that bear the burden of health care costs such as businesses, households, and government but concerns still exist regarding health care cost, particularly the cost of prescription drugs (Obama, 2016). Medicare's payment policy changes, program integrity efforts, and competitive bidding policies played a role in the slowdown of health care spending (Office of the Assistant Secretary for Planning and Evaluation, 2014). However, the provisions of the ACA relating to Medicaid expansion and the health insurance marketplaces posed a challenge to health care spending through the extension of health coverage to the over 30 million Americans previously uninsured (Hartman et al., 2015).

Chronic disease contributes to health and economic burden (Nianogo & Arah, 2015). In 2017, the estimated total cost of treating diabetes amounted to \$327 billion, reflecting a 26% increase from the 2012 estimate with prescription drugs reported as the largest contributor to the cost of treating diabetes (Arlington, 2018). Although the advancement in technology contributed to improvement in the delivery of health care (Moja et al., 2014), the escalation of technological innovations in health care and increased treatment capabilities such as advances in cardiac procedures and imaging also



contributed to increased health care spending (Gordon et al., 2014), which is another example of the complex nature in which the health care environment operates. The development of new technologies assisting patients to live longer and more meaningful lives (Ramsey, Ganz, Shankaran, Peppercorn, & Emanuel, 2013) as well as inpatient cost also contributed to the national health expenditure (Filmore, Bray, & Kawamoto, 2013).

Increased life expectancy and the aging population also played a role in the burden of health care cost as the older population rely on public programs such as Medicaid and Medicare, resulting in higher health care spending as the number of beneficiaries increased (Gordon et al., 2014). In 2009, the U.S. Government authorized \$27 billion in financial incentives through the HITECH Act of 2009 to facilitate the adoption and implementation of the technological advancements such as the EHR system in eligible health care facilities to promote the reduction in health care costs (Dranove et al., 2015). Rising health care cost extends beyond the boundaries of the US.

### **Global Perspective**

Cook, Cole, Asaria, Jabbour, and Francis (2014) examined the total direct and indirect burden of heart failure-related disease globally and noted an estimated cost of \$108 billion in 2012 with the US leading as the greatest contributor. Guilcher, Bronskill, Guan, and Wodchis (2016) examined health care expenditure and patterns of spending by high-cost health system users in Ontario, Canada and found among the population of community cohorts, 697, 059 patient care episodes accounted for nearly 70% of total annual expenditure funded publicly and 58.5% of the cohort had eight or more comorbid diseases. The Canadian Government established the Canada Health Info in 2001,

providing \$2.1 billion in funding up to 2013 for the development of interoperable e-health with the aim of improving access and quality of health care and promoting easier access to health information among clinicians and patients (Daniels, 2014).

The United Kingdom National Health Services (NHS) highlighted the gaps in health care delivery including health and wealth being, care and quality, and funding and efficiency, noting technology could improve care outcomes, efficiency, and avoid spending billions of pounds on preventable illnesses (NHS, 2014). In Australia, the government initiated the exchange of paper-based records to EHRs with the intended benefit of increased availability and accessibility of patients' medical records among health care providers and consumers (Aminpour et al., 2014). Bloomfield et al. (2015) explored strategies for the management of diabetes and hypertension locally, nationally, regionally, and globally with the global effort centered in China and Kenya, noting technologies such as EHRs provide opportunities to identify at-risk patients and promote improvement in health. Low- and middle-income countries face greater challenges with health care delivery and costs of health care.

Jakovjevic and Getzen (2016) noted the increase in the demand for health care services in developing countries such as China, India, and South Africa contributed to the growth of health expenditure in these countries. Jakovjevic and Getzen posited a vast majority of developing countries will face obstacles in the sustainability of their national health systems highlighting significant challenges such as population aging and urbanization. Bollyky, Templin, Cohen, and Dieleman (2017) noted lower-income countries require an increase in resources used for health care delivery to facilitate

adaptation to the rate of increase in non-communicable disease. Bollyky et al. also measured the rate of the shift of noncommunicable diseases compared to the preparedness of the health system to handle the change and found a greater increase in the burden of noncommunicable diseases in lower-income countries and fastest in countries not equipped to managed and treat non-communicable disease. Akhlaq, McKinstry, Muhammad, and Sheikh, (2016) noted an initiation process of health system reform in some low- and middle-income countries to include introduction of technologies such as the EHR to enhance the quality of health care delivery. However, Akhlaq et al. noted the substantial financial resources required to implement technologies such as the EHR remains a significant barrier to implementation. Developmental infrastructures hindering the implementation in low- and middle-income countries include lack of or limited access to electricity, computers, or the internet.

### **EHR Incentive Program and Meeting MU Criteria**

The U.S. Government established the HITECH Act with the aim of facilitating the adoption of EHR systems by providers and health care organizations (Jones, Rudin, Perry, & Shekelle, 2014; Weeks et al., 2014). The intended benefit of the HITECH Act relates to the improvement in the medical care provided and reducing the cost of health care (ONCHIT, 2014). Efforts to increase adoption of EHR nationwide included the introduction of the Medicare and Medicaid EHR Incentive Programs (ONCHIT, 2015).

### **MU Criteria**

The HHS developed the MU criteria intended to promote data capture and sharing, foster the exchange of health information, and improve patient outcomes (CDC,

2016; Krist et al., 2014). Health care providers and organizations must meet the MU criteria to qualify for the financial incentives available to aid in the implementation of EHR (Dranove et al., 2015). Failure to adopt a certified EHR and meet the standards of MU could result in penalties (CDC, 2016). Health care organizations and providers must meet the MU requirements or face a 1% reduction in Medicaid/Medicare reimbursement by 2017 (CDC, 2016) with an additional 1% reduction for each year of non-compliance up to 5% (Barrett, 2018). Hospitals and health care professionals who adopted the MU criteria received over \$28 billion in incentive payments and nine-in-ten qualifying hospitals received incentive payments for adopting and meaningfully using certified HIT (ONCHIT, 2015).

The number of hospitals receiving payments and achieving MU criteria increased with over 237, 000 providers successfully registered for the Medicare incentive program, (Wright et al., 2014). Hospitals showed significant improvement in the number that met the MU criteria, however, some hospitals still lagged behind (Adler-Milstein, DesRoches, et al., 2015) affected by the complexity of the health care environment including the practice size, practice type, and incentive programs with primary care practices more likely to demonstrate MU capabilities than specialty practices (Shea, Reiter, Weaver, Thornhill, & Malone, 2015). Walker and Diana (2016) found just over half of hospitals meet the Stage 1 MU criteria for electronic public health reporting.

Additionally, Kern, Edwards, and Kaushal (2015) found 44% of primary care physicians achieved MU in 2011, and 56% did not. However, Kern et al. concluded no difference in the quality of care existed between the group that qualified for MU in 2011

and the one that did not. The rate of physicians performing care processes related to meeting the MU requirement and improved patient outcomes such as care coordination, patient communication, and population management varied with less than half reporting performing at least one quality measure routinely (King, Patel, Jamoom, & DesRoches, 2016). Evaluation of physician's adoption of EHR and meeting MU criteria showed fewer than two-thirds of family physicians reported having EHR capabilities for meeting the stage 2 and 3 MU requirements, which could lead to additional substantial HIT investment or upgrading of existing software (Peterson, 2015).

The Regional Extension Center programs implemented to support small, rural, and underserved practices facilitated over 100,000 health care organizations in adopting certified EHR technology, Stage 2 of the MU criteria (Lynch et al., 2014). Lynch et al. (2014) noted these facilities met MU requirements such as clinical quality reporting, e-prescribing, and medication reconciliation. Benefits and potential benefits of EHR include improvement in patient safety and quality, reduction in health care cost, increased efficiency of delivery of care, and reduction in the ordering of duplicate testing (Kermin et al., 2016). Campanella et al. (2015) highlighted the relevance of information technologies in the health care industry, noting EHR aids clinicians in the clinical decision-making process.

### **Benefits of EHR Implementation**

In examining data from the non-federal acute-care hospital between 2006 to 2010, Appari, Johnson, and Anthony (2013) found hospitals that transition to an EHR system capable of meeting the MU goals experienced higher process quality for some clinical

conditions. Eighty-two percent of physicians who use the EHR system noted improvement in the quality of clinical decisions, 86% reported averted medical errors, and another 85% reported improvement in preventative care (Bardhan & Thouin, 2013). Examination of medical error occurrences in physician dictation in the absence of quality assurance indicated that physicians contributed significantly to medical errors in their dictation process, up to 315,000 in 1 million dictations, but less likely discovered in the absence of quality assurance (David, Chand, & Sankaranarayanan, 2014). David et al. (2014) highlighted the benefits of using EHR in quality assurance processes to assess the accuracy of medical record documentation by physician dictation. Additionally, the benefits of EHR implementation include improvement in patient safety and better medical care (Mack et al., 2016; Heart, Ben-Assuli, & Shabtai, 2017).

Frimpong et al. (2013) used quality of care measures including discharge summary, notifications for preventative follow-up care, and timely appointment for specialty care to determine the association between quality of care and HIT capacity at Federally Qualified Health Centers. Frimpong et al. found a significant association between high HIT capacity and increased use of reminders to facilitate follow-up care to patients for preventative services, discharge summaries, and appointment for specialty care. HIT also plays an essential role in improving patient outcome, reducing medical errors and adverse drug effects, increasing time efficiency and guideline adherence, and reducing health care cost (Campanella et al., 2015).

Bar-Dayana et al. (2013) examined the effectiveness of EHR use in promoting cost-savings by incorporating a list of preferred specialty care providers and a fixed set of

referral goals into the EHR system and found utilizing the EHR system positively affect net financial return. Bar-Dayana et al. noted the incorporation of preferred providers into the EHR system resulted in a lower implementation cost and increase efficiency in organizational processes. Payne et al. (2015) noted HIT implementation also contributes to the reduction of adverse drug events, increasing the quality and efficiency of delivery of care, and reducing costs. Evidence showed the benefits of EHR in primary care including a reduction in morbidity, extension of life span, and cost effectiveness (Krist et al., 2014).

Further benefit of HIT includes patient access to clinical information. The use, satisfaction, and effect of patient web portal on the patient-provider relationship and empowerment among patients suffering from rheumatoid arthritis reflected 54% of participants with an Internet access viewed their EHR and reflected confidence in the ease and usefulness of the portal (van der Vaart et al., 2014). van der Vaart et al. (2014) concluded patient web portal with EHR access provides patients with access to usable and understandable personal information. Utilizing HIT systems such as clinical, patient scheduling, and HR systems positively affect process quality, decision support capabilities, and promote conformance to evidence-based and best practice guidelines (Bardhan & Thouin, 2013).

Examination of the effects of HIT applications on hospital expenses and the quality of health care delivery processes associated with evidence-based measures for acute myocardial infarction (AMI), heart failure, pneumonia, and surgical infection prevention (SIP) showed the use of EHR reflected an association with evidence-based

quality processes (Bardhan & Thouin, 2013). Bardhan and Thouin (2013) also found a positive relationship between the usage of hospital scheduling and Human Resource systems with regards to conformance to best practices for AMI, heart failure, pneumonia, and SIP. However, researchers highlighted mixed reviews on the benefits of EHR in some settings. Clinicians in public health setting reported greater dissatisfaction with EHR due to documentation and interface navigation challenges as well as the variation in processes and terminology (Crowley et al., 2019).

McAlearney, Hefner, Sieck, Rizer, and Huerta (2015) reported concerns regarding the integration of EHR in the ambulatory setting, noting use of EHR does not equate to meaningful integration into practice. Office-based pediatric settings reflected almost 80% EHR adoption but only few indicated use a basic or fully functional EHR or EHR with pediatric capabilities (Lehmann, O'Connor, Shorte, & Johnson, 2015). Additionally, examination of the benefits of EHR reflected concerns regarding the cost effectiveness of HIT use in health care. The high cost and expertise necessary for the implementation and maintenance of EHR systems create a barrier to EHR adoption and prohibit some health care organization particularly small rural hospitals from adopting EHR (Jin & Chen, 2015; Kruse, Kristof, Jones, Mitchell, & Martinez, 2016). Negligible evidence exists supporting the cost-saving benefits of EHR implementation (Mennemeyer, Menachemi, Rahurkar, & Ford, 2016) and the uncertainty surrounding the costs and benefits of HIT implementation posed a challenge in fully appreciating the representative economic value (Ahmed, Barber, Jani, Garfield, & Franklin, 2016).



Examination of the association between the implementation of outpatient EHR and emergency department (ED) visits, hospitalization, and office visits for patients with diabetes reflected moderately lower rates of unfavorable clinical events and a significant reduction in ED visits and hospitalizations (Reed et al., 2013). Another benefit of EHR relates to communication of patient information. Use of EHR facilitates exchange of patient information, which contributed to the reduction of duplicate testing (Ayabakan, Bardhan, Zheng, & Kirksey, 2017). Ayabakan et al. (2017) explored the effect of health information exchange for patients with congestive heart failure in hospital outpatient clinics and found exchange of patient information between organizations reduce the rate of radiology and laboratory testing. However, Ayabakan et al. noted the findings did not reflect a reduction in laboratory testing with intraorganizational information exchange.

Using integrated EHR system in five multispecialty physician group practices to display the cost of laboratory test revealed significant reduction in the ordering rates of laboratory test by physicians and facilitate cost transparency and reduction in laboratory test use (Horn, Koplan, Senese, Orav, & Sequist, 2014). Using retrospective data from 2000 emergency department (ED) computed tomography (CT) scan of the head over a three-month period, Franczak et al. (2014) examined the use of EHR in the ED to determine how often the EHR accessed by the interpreting radiologist provided additional information relevant to interpreting the imaging studies. Franczak et al. found additional information present in 49.3% of the CT scans and posited potential benefits of EHR exist in optimizing information sharing among providers. Using computerized physician order entry (CPOE) also showed positive benefits. Also, the EHR facilitates improvement in

the documentation process as health care providers can more accurately and completely document the medical records, (Bjarnadottir, Herzig, Travers, Castle, & Stone, 2016),

Forrester, Hepp, Roth, Wirtz, and Devine (2014) examined the cost-effectiveness of using CPOE versus paper-based medication prescribing in reducing medication errors and adverse drug events in the ambulatory care setting and found the adoption of CPOE and elimination of paper-based prescribing resulted in improved medication safety and a reduction in costs. Additionally, the benefits of EHR in the medication management process include facilitating medication reconciliation to promote the accuracy of the medication list in a shared environment, offering real-time feedback, enhancing coordination of care, and increasing patient adherence (Krenn & Schlossman, 2017). In comparison, Yadav et al. (2016) conducted a retrospective study to evaluate the physical examination findings between EHR and paper-based medical records following conversion to an EHR system and found inaccurate documentation of physical examination findings occurred in 24% of the EHR medical records evaluated vs. 4.4% in the paper-based medical records. However, Yadav et al. found more omissions in the paper-based medical notes (41.2%) than the EHR records (17.6%), and accurate documentation of the EHR and paper-based system occurred at similar rates (58.4% vs. 54.4% respectively). Yadav et al. concluded the likelihood of inaccurate documentation of physical examination findings increased in EHR system, however, the likelihood of omissions increased in the paper-based system. Not all workflow and processes reflected benefits relating to EHR implementation and some studies showed minimal benefit of EHR adoption.

Kerwin, Leighton, Buch, Avezbadalov, and Kianfar (2016) compared the pre-EHR rate of duplicate transthoracic echocardiography testing to that of two twelve-month periods after implementation and found duplicate transthoracic echocardiography ordering did not decrease post implementation of EHR. Kerwin et al. noted instead, an increase in duplicate testing initially with a delayed indication of reduction in duplicate ordering between the first year and most recent year of EHR implementation.

An evaluation of hospitals before and after the adoption of HIT showed an increase in medical expenditures after HIT adoption and contributed to higher cost of inpatient stays; and no change in hospital length of stay or in the number of physicians the patient sees (Agha, 2014). However, examination of the association between provider access to patient information from a HIE system by ambulatory providers and 30-day same-cause readmission post-discharge reflected a 57% lower chance of readmission, indicating provider usage of community-wide patient records via a HIE system could reduce hospital readmission and health care cost (Vest, Kern, Silver, & Kaushal, 2015). However, Adler-Milstein, Everson, and Lee (2015) found inconsistent results relating to whether EHR adoption leads to better quality of care and lower health care cost. Furthermore, studies showed minimal benefits of EHR when exploring the effects of EHR on morbidity, mortality, and re-hospitalization.

A comparison of health care facilities using computerized decision support systems (CDSS) linked to EHR showed little evidence for changes in mortality when compared to health care settings without a CDSS (Moja et al., 2014). However, Moja et al. (2014) found a reduction in the risk ratio for morbidity of 10% to 18% making CDSS

linked with EHR a formidable initiative for quality improvement interventions for the potential benefits on health outcomes. Likewise, an examination of the relationship between the adoption of the basic EHR and re-hospitalization, mortality, and length of stay before and after EHR adoption showed an association between the adoption of EHR and a small, but statistically significant reduction in 30-day mortality and 30-day re-hospitalization (Lee, Kuo, & Goodwin, 2013). Also, in examining the effectiveness of HIE on cost, service use, and quality, Rahrurkar, Vest, and Menachemi (2015) noted 57% of the articles examined showed some benefits of HIE, noting research depicting long-term studies did not reflect significant benefits associated with HIE.

Meeks et al. (2014) noted the use of EHR could pose unintended risks, emphasizing the need for a proactive approach to minimize safety-related risks, and suggested a systematic analysis of safety concerns related to EHR. Additionally, the increasing volume of data associated with EHR use posed a challenge to the data management capabilities of health care organizations (Wang, Kung, Wang, & Cegielski, 2018). The review of the literature reveals variability in the extent of the benefits associated with EHR use, however, exploration of the effect of EHR on health care quality found EHR can improve quality, reduce errors, and improve efficiency (Campanella et al., 2015). Adler-Milstein, Everson, et al. (2015) found hospitals nationwide showed consistent improvement in performance over time from (a) the adoption of EHR functions and (b) improvement in EHR technology and implementation. However, Adler-Milstein, Everson, et al. found the relationship between EHR adoption and outcomes varied depending on the attestation of MU, noting time-related effects could

play an important role in driving the high performance. The literature also reflected many challenges in the adoption and implementation of EHR.

### **Challenges in EHR Implementation Effort**

Despite the advancement in the implementation and adoption of EHR some hospitals face challenges in the implementation process including struggles with implementing physician notes, physician resistance, complexity of meeting the MU criteria, and controlling the up-front and ongoing costs associated with the adoption of EHR (Adler-Milstein, DesRoches, et al., 2015). Health care organizations require substantial resources including financial, human, and organizational investments to facilitate the EHR implementation process (Hunt et al., 2015). Implementation cost, privacy and safety concerns, IT literacy, infrastructure resources, and internal organizational characteristics such as the motivation to change and the flexibility for embracing innovation contribute to EHR implementation challenges (Ramsey, Lord, Torrey, Marsch, & Lardiere, 2016).

The primary barrier reported by physicians to EHR adoption relates to financial issues (Adler-Milstein, DesRoches, et al., 2015). Additionally, although government investment in HIE could prove beneficial (Ramsey et al., 2016), concerns exist relating to the adequacy of EHR implementation to ensure financial improvement for some health care practices (Collum, Menachemi, & Sen, 2016). Collum et al. (2015) noted hospitals adopting a comprehensive EHR system with several functionalities in all units of the hospital compared to those implementing a basic EHR system with fewer functionalities experienced a greater increase in financial return. Additionally, hospitals not eligible for

the meaningful-use incentive programs such as rehabilitation facilities, long-term care, and psychiatric hospitals experience greater challenge with the adoption of EHR systems due to the costs of implementation, unknown return on investment, and implementation challenges (Walker, Mora, Demosthenidy, Menachemi, & Diana, 2016). Walker et al. (2016) noted while ineligible hospitals showed expansion in the EHR adoption rate, evidence indicates a significant difference in the adoption rate between eligible and ineligible hospitals and recommended expanding the eligibility criteria for meaningful-use financial incentives to facilitate closing the gap in the EHR adoption between eligible and illegible hospitals (Walker et al., 2016). Despite the positive results in the implementation of EHR nationally, disparities remain among smaller practices and practices serving rural and underserved populations (Mark et al., 2016). Mark et al. (2016) noted increased availability may not necessarily result in equal benefits for all communities.

Neumeier, Berner, Burke, and Azuero (2015) also highlighted the planning and budgetary challenges hospital leaders face in prioritizing the necessary requirements for implementing IT infrastructure capable of meeting the MU criteria and argued the strategies employed must balance with the budgetary requirements for IT and other organizational demand. Neumeier et al. examined non-federal IT budgets during the period 2009 to 2011 to determine what percentage of the hospital's annual operating budget used for IT resource funding and found no overall increase in IT budget. However, a comparison of academic versus non-academic hospitals showed academic hospitals spent an average of 32% higher operating budget on IT infrastructure compared

to non-academic hospitals (Neumeier et al., 2015). Madden, Lakoma, Rusinak, Lu, and Soumerai (2016) argued thoughtful consideration must be given to prioritizing further investment in health information given the fragmentation of health care, and poor EHR interoperability, usability, and information exchange. Clinical work flow and physician acceptance of the EHR system also posed challenges to the adoption of EHR.

In examining the documentation of patient information in the EHR focusing on different aspects of care for mental health patients, Madden et al. (2016) noted information relating to the outpatient behavioral care of patients with depression and bipolar disorder not captured by the EHR system. Madden et al. reported up to 89% of acute psychiatric services reflected missing information from the EHR including diagnoses and concluded, inadequately capturing relevant health information in the EHR posed a concern. Assessment of the MU of EHR in some primary care setting to determine quality improvement (QI) strategies to improve patient care showed variability of and barriers to the QI-related EHR initiatives (Meehan et al., 2014).

Providers have not entirely embraced the QI initiatives, reflecting concerns that despite increased adoption of EHR, most providers face challenges in EHR implementation, and lack the knowledge and skills necessary to achieve improvements in processes and outcomes (Meehan et al., 2014). Ajami and Bagheri-Tadi (2013) examined physician's perceptions of the barriers to adoption of EHR, and how these barriers affect physician's acceptance and resistance of the use of EHR and found despite the positive benefits of EHR use in medical practices, resistance by physicians remain a challenge. Uncertain payoffs, sub-optimal technology, varying perceptions between professional

groups, and resistance to change contribute to the concerns relating to physicians' acceptance of the EHR system (Gagnon et al., 2014). Gagnon et al. (2014) argued physician's acceptance of the EHR necessitates significant financial investment and learning effort and noted buy-in of health care professionals played an important role in realizing the potential benefits of EHR.

Most hospitals experienced significant financial barriers in implementing HIT as well as issues of workflow, staffing, and technical challenges (Gabriel et al., 2014). However, increase in the staffing levels during the implementation phase could improve efficiency and workflow (McDowell, Wu, Ehrenfeld, & Urman, 2017). Additionally, time, interfaces with the doctor-patient relationship, lack of incentives, complexity of the usability of the system, and costly interfaces necessary for the required functionality of the EHR system also posed a challenge in the adoption and implementation process (Krist et al., 2014). Yen, McAlearney, Sieck, Hefner, and Huerta (2017) noted implementation plans and timelines could contribute to the success of the implementation process. Recommended interventions for implementing EHRs include establishing strong leadership, using project manager technique, training staff, and including EHR training in medical curriculums (Ajami & Bagheri-Tadi, 2013). Additionally, exploration of the role of organizational learning in the implementation and adoption of EHR showed an association between organizational learning and the implementation and adoption of EHR (Takin, Sheikh, & Barber, 2014). Takin et al. also posited fundamental differences existed in the visions of EHR and the implementation strategy among some hospitals noting an understanding of organizational learning and its enabling factors could



potentially support the national implementation efforts of EHR. Additionally, Clark et al. (2017) presented key areas of focus when managing change such as the change necessary when implementing EHR systems and include attending to learning.

Unintended consequences such as shifting of administrative task and documentation burden also posed a challenge in the adoption and implementation of EHR and the MU criteria (Olayiwola, Rubin, Slomoff, Woldeyesus, & Willard-Grace, 2016). Inability to commit to large capital-intensive projects due to limitations in cash flow hinders health care institutions from achieving the MU criteria (Adler-Milstein, DesRoches, et al., 2015; Lehmann et al., 2015). The drive for digitization of health care data and the resulting big data analytics also presented a vast array of data challenges such as ensuring safety and privacy of patient information (Raghupathi & Raghupathi, 2014).

The extensive electronic health care data proved challenging in identifying meaningful patterns in the visualization of health care data and necessitate the development of better ways to manage data to promote discovery of information within the data (West, Borland, & Hammond, 2015). The widespread emphasis on health care focusses on interoperability and sharing of patient information to improve the standards of care and the decision-making process relating to quality of care (Gheorghiu & Hagens, 2016; Heart et al., 2017). The interoperability functionalities of EHR systems facilitate HIE and access and retrieval of patient data (Rezaeibagha, Win, & Susilo, 2015). The goals of HIE include facilitating the flow of patient information in a secure manner

between providers involved in the care of the patient, and promote coordinated, effective, and efficient patient care from these providers (Downing et al., 2017).

While the objective of HIE includes improved patient care, protecting the privacy of patient while delivering the benefits of HIE posed a challenge in the exchange of patient information (Downing et al., 2017). Rezaeibagha et al. (2015) highlighted the importance of focusing on standards and policies to promote the effectiveness and efficiency in which patient's information follows them as they transition among providers and should address security, quality of care, confidentiality and patient privacy, as well as organizational processes and workflow. Monitoring the system to assess usage and accurate representation of care promotes patient safety and confidentiality and facilitate improvement in the usability of the EHR system (Daly, 2016; Sittig, Belmont, & Singh, 2018). Babrahem and Monowar (2018) emphasized the need for health care organizations to maintain a high level of confidentiality of patient records and recognizing confidentiality as a standard requirement for the development of the EHR system.

Several contingent factors contributed to the success or failure of the implementation of EHR including system development issues, such as lack of uniform standards or clear project plan, privacy and security issues, unrealistic time constraints, and interoperability of the EHR system with existing systems (Nguyen, Bellucci, & Nguyen, 2014). Other challenges of high-volume data relate to concerns of information overload including ignoring, overlooking, or misinterpreting data, which could lead to incorrect diagnosis and management of care (Caban & Gotz, 2015). Nguyen et al. (2014) concluded, overall, a growing acceptance of EHR exist despite the concerns. In an

analysis of the adoption and use of EHR and HIE network in other countries, Ben-Assuli (2015) highlighted similar implementation challenges as seen in the US such as unsuitable Internet connections, lack of clarity on how to use the EHR system, and financial-related issues. Low- and middle-income countries face challenges in implementing the EHR such as restricted resources (Fritz, Tilahun, & Dugas, 2015). Fritz et al. noted low resource settings usually rely on donor funding and argued inadequate funding could affect the sustainability and scalability of the EHR system if the funding period does not incorporate thorough training of staff to ensure support and further development. Dasari, Garbett, Miller, Machain, and Puyana (2016) also examined the barriers to implementation in low- and middle-income countries and found hierarchical structures and power interplay affect the implementation process of the EHR system as well as environmental challenges such as sufficient hardware and internet quality. Muinga et al. found lack of power, inadequate resource, and networking issues pose a major challenge to the implementation of EHR in low- and middle-income setting. Additionally, Muinga et al. noted human factors challenges such as acceptability and ownership also influenced the EHR implementation. Dasari et al. also found the most important factors influencing EHR implementation include identifying the roles of who would use the EHR for documentation, and responsibilities regarding the monitoring of the quality of the documentation. Legal concerns relating to the protection of clinical information in the information sharing process and shortcuts in care also posed a challenge.

Flanagan, Saleem, Millitello, Russ, and Doebbeling (2013) also examined the issue of downtime in the primary care setting and explored the source used for workarounds (i.e.) paper-based versus computer-based. Sittig, Gonzalez, and Singh (2014) explored institutional practice's handling of situations such as EHR downtime and found nearly 96% of respondents reported at least one unplanned EHR downtime and three institutions reported one or more patient injury occurring during EHR downtime. EHR downtime posed significant risk to the delivery of patient care and a serious concern for patient safety (Palojoki, Pajunen, Saranto, & Lehtonen, 2016). Flanagan et al. found workarounds to EHR use relates to knowledge and skill; complexity of the task; trust; and unavailability of a correct path, noting constant workarounds suggest common challenges and failures to address these challenges in the design process of the EHR system. The EHR design process should include a focus on the end user to ensure uptake and usability and reflect the team-based approach typically used in health care (Flanagan et al., 2013). Sittig et al. (2014) emphasized the relevance of having strategies in place to maintain the EHR system and ensure continuity of care. Despite the measures and recommendations for EHR adoption, significant variations exist in the commitment of EHR adoption among states, indicating geographical gaps in the adoption rate (Bardhan & Thouin, 2013; Xierali et al., 2013).

### **Progress in the Implementation of EHR**

An overview of the progress towards nationwide adoption of the EHR since the enactment of the HITECH Act in 2009, indicated health care organizations and providers reflected varying phases of adoption and implementation of EHR. The EHR adoption

among hospitals and physicians, grew significantly since the passage of the HITECH Act and in 2013, 59% of hospitals and 48% of physicians implemented at least the basic EHR system, reflecting increases of 47% and 26% respectively since 2009 (Doberne et al., 2015; ONCHIT, 2014). A comparison of the data presented showed before the HITECH Act only 12% of hospitals adopted the EHR system in 2009 (ONCHIT, 2014).

The adoption rate of EHR increased significantly since 2010 with higher adoption rate found in large, urban, not-for-profit, teaching hospitals (Adler-Milstein et al., 2014). Exploration of the implementation rate of EHR showed an increase in the basic EHR adoption rate from 33.4% to 41.1% between 2013 and 2014 and an increase in the comprehensive EHR from 25.5% to 34.1% (Adler-Milstein, DesRoches, et al., 2015). The EHR adoption rate for family physicians reflected 68% nationally in 2011 and exceeds other office-based physicians (Xierali et al., 2013).

Assessment of the differences in the adoption rates in office-based physician practices in urban and rural areas of the US showed higher adoption rates for physician practices located in rural areas compared to those in urban areas (Whitacre, 2015). Whitacre (2015) noted a 56% adoption rate in rural areas vs. 49% in urban areas in 2012 and concluded the Regional Extension Centers outreach efforts contributed to the EHR adoption in these areas. However, Whitacre noted several specialty practices and sole practitioners reflected less than 50% adoption rates, lagging significantly in the implementation of EHR. Examination of the intent of physicians to participate in the EHR incentive program and physician's preparedness in meeting the MU objectives in 2013 showed 69% of physicians intended to participate in the incentive program (Hsiao

& Hing, 2014).

Hsiao and Hing (2014) noted of those intending to participate, 19% reflected an EHR system with the capabilities to support the MU objectives and 56% lack the capabilities to support the MU objectives. Hsiao and Hing also found office-based physicians increased their adoption rate of EHR by 21% between 2012 and 2013. The authors noted adoption of any EHR system by office-based physicians showed an increase from 48% in 2009 to 78% in 2013, and 48% of office-based physicians had a basic EHR system in 2013. However, results showed variation in adoption rate across states ranging from 21% in New Jersey to 94% in Minnesota (Hsiao & Hing, 2014). Research also showed improvement in the sharing of clinical information between hospitals and providers, one of the goals for EHR implementation.

Furukawa, Patel, Charles, Swain, and Mostashari (2013) explored the extent of increase of HIE between hospitals and providers during the period 2008 to 2012 since the enactment of the HITECH Act and found in 2012, 50% of hospitals shared clinical information between providers, accounting for an increase of 41% since 2008. Furukawa et al. also found 44% of hospitals adopted the minimum basic EHR system, and 29% participated in a regional health information organization (HIO) with the highest rate of clinical information exchange occurring in hospitals that adopted the basic EHR and participated in a HIO. The progress of the overall national EHR adoption rate reflected a gap in EHR adoption rate for various health care organizations (Adler-Milstein et al., 2014) and the levels of adoption varied among specialties.

Assessment of nursing homes across New York State between 2011 and 2012

showed 18% of all participating nursing homes indicated full implementation of EHR with most participating in HIE; 30% reflected partial implementation, and 11.4% reported no EHR implementation (Abramson, McGinnis, Moore, Kaushal, & the HITEC investigators, 2014). Gabriel, Jones, Samy, and King (2014) examined the progress of HIT adoption in critical-access hospitals in rural areas and found these hospitals achieve success in the adoption of some aspects of HIT with 89% implementing full or partial EHR. Small and rural hospitals still lagged behind in the EHR adoption process (Adler-Milstein et al., 2014; Dranove et al., 2015). Despite the progress and benefits of EHR implementation and use, mixed perceptions and dissatisfaction existed among health care providers.

### **Clinicians Perspectives on the Use of EHR**

King et al. (2014) examined physician's perceptions of the use of EHR and clinical benefits, and whether the EHR used by physicians met the MU criteria and found 76% of the physicians surveyed reported their EHR met the MU criteria, and eight out of 10 physicians reported the use of EHR enhanced patient care. Additionally, Meehan (2015) interviewed nurses to gain end user's perspectives of EHR use and identify clinical implications, and system and process improvement and found that end user's perceptions directly affects how the health care facility derive the intended use of EHR. Furthermore, Meehan noted nursing staff adapted to the changing landscape of electronically communicating patient information with other care providers and agreed that using EHR over paper documentation resulted in improvement in the quality of care. However, researchers identified physician's dissatisfaction in the use of EHR due to

negative effect on workflow and time, excessiveness of the documentation and effect on physician-patient interaction (Doberne et al., 2015). Vahdat, Griffin, Stahl, and Yang (2018) found the additional time required for documentation resulted in an increase in patient wait time.

Jamoom, Patel, Furukawa, and King (2014) explored a comparative perspective of non-federal physicians who adopted EHRs and those who did not, examining the physician's perspectives on three key areas, the expected effect of EHRs on clinical care, practice efficiency and operations; barriers to EHR adoption; and the influence of major policy initiatives that contribute to EHR adoption. Jamoom et al. found most physicians agree EHR contributed to clinical benefits, efficient practices, and financial benefits. However, Jamoom et al. concluded the greatest influence on EHR adoption included MU financial incentives and penalties, technical assistance, and electronic health information exchange capability, noting the major barriers reported by non-adopters included purchase cost and productivity loss.

Makam et al. (2013) explored the provider's use and satisfaction with performing the common EHR task such as documentation, medication prescribing, and problem list and found a suboptimal use of the EHR among most providers as well as dissatisfaction with some of the core features including documentation of preventative services. Makam et al. argued the relevance of greater emphasis on optimizing provider use of key functions of EHR rather than a focus on the implementation of EHR that meets the MU criteria. The literature reflected training as a significant concern in the successful implementation of EHR systems.



### **Effect of Technological Support During the Implementation Process**

As part of the HITECH incentive program, the National Coordinator for HIT awarded 116 million to support training, implementation, and optimization of the EHR system; facilitate the MU of EHR; and address barriers to EHR adoption (HealthIT.gov, 2014). The four key programs identified include (a) Program of Assistance for University-Based Training, (b) Community College Consortia to Educate Information Technology Professionals in Health Care, (c) Curriculum Development Centers Program, and (d) Competency Examination for Individuals Completing Non-Degree Training (HealthIT.gov, 2014). Ryan, Bishop, Shih, and Casalino (2013) indicated technological assistance affected outcomes related to the quality of care noting, an association existed between EHR adoption and higher quality of care on the part of physicians who received extensive technical assistance versus those who received low to moderate levels of technological support. Furthermore, Boas, Bishop, Ryan, Shih, and Casalino (2014) examined physicians' experiences with Primary Care Information Project and Regional Extension Centers, which supports the implementation and use of EHR and found physicians using EHR and receiving technical assistance reported improvement in the quality of the delivery of patient care. However, Ryan et al. argued EHR implementation alone proved insufficient for improvement of the quality of care even among physicians who received technical assistance.

### **Health care Implementation Processes**

Strategic approaches used in the EHR adoption and implementation varies and can include a top-down government-driven centralized system, a bottom-up approach

involving the transformation or development of new health care information systems, or a middle-out approach in which health care providers and IT vendors progressively make changes to information systems to comply with the national information standards (Fragidis & Chatzoglou, 2018). Fragidis and Chatzoglou (2018) noted the US employed a bottom-up approach to promote the nationwide adoption of EHR. End-user perceptions; the expertise and experience of all key stakeholders including nurses, and physicians; and the effective collaboration between the software developers, policy-makers, and administrators drive the successful implementation of EHR systems (Ballaro & Washington, 2016). Additionally, alignment of the vendor selection strategy with the organizational strategies and decision-making structure contributes to the success of the implementation process (Ford, Silvera, Kazley, Diana, & Huerta, 2016). However, Olayiwola et al. (2016) noted the goals of the vendor and health care organization are more aligned than is recognized.

Factors related to successful EHR implementation include time constraints, system integration interoperability concerns, user participations and cooperation in training, skills of the implementation team, lack of uniform standards and guidelines, and unclear project plan and design (Nugyen et al., 2014). The organizational structure, support of the EHR system, and the availability of technical infrastructure affects EHR implementation (Fritz et al., 2015). Technology such as EHR can result in disruption of workflow and increased time to perform tasks as well as decreased face-to-face communication with patients and can result in resistance to the change necessary for the successful implementation of EHR systems (Barrett, 2018). Barrett posited the quality of

communication relating to EHR system implementation and usage will play a critical role in successfully implementing the EHR and recommended viewing resistance through the lens of a job characteristics model noting the various work-related priorities of the stakeholders can cause them to react differently to the EHR implementation.

The adoption and implementation of EHR involve change at both the individual and organizational level (McAlearney, Hefner, Sieck, & Huerta, 2015). McAlearney et al. (2015) found applying change principles can facilitate the successful implementation of EHR noting conceptualizing EHR adoption through the lens of personal loss and grief and developing EHR implementation through an organizational change management model could promote physician adoption of EHR systems in clinical practice. Boonstra et al. (2014) identified several interventions in line with the change management process, which could contribute to successful EHR implementation including active involvement and real-time support from Management, training end-users, and developing a comprehensive implementation strategy offering clear guidance.

Involving multiple stakeholders and clinical staff in the implementation process, addressing staff concerns, assigning sufficient staff to the EHR implementation process, and identifying champions to facilitate a reduction in resistance could foster EHR implementation success (Boonstra et al., 2014). Ross, Stevenson, Lau, and Murray (2016) identified training as an important factor in EHR implementation success. Bushelle-Edghill, Brown, and Dong (2017) noted before the implementation of the EHR system, health care organizations should place greater emphasis on end user training to realize the full benefits of the use of the EHR. Additionally, Baumann, Baker, and Elshaug (2018)

recognized the importance of training to promote ease of use of the EHR system by the end users. However, despite training and support, clinicians experience increased cognitive workload relating to data entry during the adaptation phase of EHR (Colligan, Potts, Finn, & Sinkin, 2015), which could negatively affect successful implementation.

Colligan et al. recommended variation in the training strategies to suit individual staff training needs and longer period of technical support during the adaptation phase. Engaging end-users to determine expectations before the start of the EHR implementation process could facilitate full user adoption and involvement (Joukes, Cornet, de Bruijne, & de Keizer, 2016). Joukes et al. (2016) recommended concept mapping as a method to determine topics for consideration during the implementation phase including usability, support, training, communication, and collaboration. Lopez, Omizo, and Whealin (2018) identified four main components that contributed to successful training, (a) on-sight and face-to-face instruction, (b) training that involves hands-on application of practices, (c) Including trainers who are practicing providers and thus familiar with work flow demands, and (d) using training topics tailored to the needs of the trainees. Research showed during the EHR implementation, staff who provide direct patient care are usually pulled from their area of practice due to their experience and knowledge (Bullard, 2016).

The social construct of workarounds could positively affect the successful implementation of EHR through the influence of surrounding co-worker's perceptions of the advantage of EHR technology, implementation success, and decreased levels of resistance to the technological change (Barrett & Stephens, 2017). Barrett and Stephens

noted participative mechanisms such as co-worker support and feedback could facilitate employee's co-construction of the technology, which could lead to acceptance of the new EHR system and successful EHR implementation. Abbott et al. (2014) recommended addressing both the technology and the implementation process when implementing health IT technologies and described six implementation best practices for successful implementation of EHR. These best practices include (a) identifying implementation methods and models, (b) collecting data about variation, (c) identifying local champions, (d) understanding how the multiple levels of complex interventions intersect and how they relate to the intervention, (e) relate fidelity of intervention, and (f) address penetration and sustainability as part of the implementation process (Abbott et al., 2014).

The implementation of EHR often involves the selection of super users, but variation exists in their effectiveness to support the implementation process (Yuan, Bradley, & Nembhard, 2015). The term super users refer to staff members selected and trained specifically in the EHR implementation process to provide training and support to other staff members. Yuan et al. (2015) found differences in the behaviors of super users appointed by the managers versus those who volunteered and noted greater implementation success occurred in units where super users employed the four key behaviors of proactivity, depth of explanation, framing, and information sharing. Sidek and Martins (2017) presented six perceived critical success factors to EHR implementation within a dental clinic context including usability of the system, emergent behaviors, requirements analysis, training, change management, and project organizations, noting awareness of these critical success factors facilitate an

understanding of the pitfalls and complexities that can derail the EHR implementation and roll-out process. Fletcher and Payne (2017) recommended using a more formal process as the size and complexity of the EHR implementation project increases including using project managers and consultants, with careful attention to the transition process. Fletcher and Payne highlighted the importance of training, suggesting techniques such as videos, hands-on training, onsite or offsite courses, and training some staff as super users to train other members of the team and serve as experts, but noted the process should start with strong leadership and clear goals. Yen et al. (2017) noted implementation plans and timelines could contribute to the success of the implementation process.

### **Transition**

The purpose of this study was to explore strategies health care leaders used in implementing EHR systems using a case study approach to explore this phenomenon. Section 1 contains the foundation and background of the study including the problem statement and purpose statement, which highlighted the main tenet of the study. Section 1 also included the nature of the study, research question, and the conceptual framework guiding the study. Additionally, Section 1 presented the significance of the study highlighting the implications to business practice and social change. Section 1 concluded with a review of the academic literature, which featured an analysis and synthesis of existing research on the implementation of EHR, highlighting the progress in the implementation of EHR as well as the benefits of fully adopting EHR nationwide.

Section 2 included a description of the research process including the selection of the research participant and the data collection methods. Section 2 also included an overview of the ethical considerations in research involving human subjects and recognizing the role of the researcher as the research instrument and the potential for bias. Section 2 also included a discussion on the data analysis process and establishing the validity and reliability of the study highlighting the techniques to enhance trustworthiness and credibility of the research such as member-checking and triangulation.

Section 3 reflected the research findings based on the analysis of the data. Also, Section 3 included the application of the research findings to professional practice and implications for social change. Additionally, Section 3 contained recommendations for action, recommendations for further research and reflections and conclusion.

## Section 2: The Project

In Section 2, I cover the research project including a discussion on the methodology and design of the study and an explanation of the choice of a qualitative case study design for this research over other methodology. In addition, Section 2 includes the steps taken in selecting participants, the process of collecting and analyzing the data, and the methods for ensuring trustworthiness of the research findings such as triangulation and member checking. Section 2 also includes a discussion of ethical considerations in research including protecting research participants, obtaining informed consent, and maintaining the confidentiality of the participants' identity.

### **Purpose Statement**

The purpose of this qualitative single case study was to explore strategies health care leaders use to implement EHR systems to reduce health care costs. The population consisted of six health care leaders from one hospital located in one island in the Caribbean selected because they successfully implemented the EHR system. The implication for social change includes the potential to provide new insight to hospital leaders who need to implement the EHR system while contributing to the opportunity for increased efficiency and promoting better patient outcomes. Achieving better patient outcomes could improve the overall population health, foster a healthier workforce, and contribute to the reduction in health care costs.

### **Role of the Researcher**

The role of the researcher is to ensure adherence to the research guidelines and principles of ethics during the data collection process, recognize personal biases, and



reduce threats that could affect the study findings (Roulston & Shelton, 2015). In qualitative studies, the researcher acts as the primary instrument in the data collection process requiring observation of behavior or face-to-face interviews with participants (Fusch & Ness, 2015). I collected data through semistructured interviews and assessment of EHR implementation policies and procedures, serving as the primary instrument for the data collection. Roulston and Shelton (2015) noted acting as the researcher instrument could potentially lead to accusations of bias due to the unpredictability of the interaction with the participants.

Personal perspectives, attitudes, or biases could unknowingly integrate into the research process and affect the results of the study (Bero, 2017). Noble and Smith (2014) noted it is the duty of the researchers to identify research bias, which could facilitate evaluation and critique of the findings by others. Recognizing and understanding how personal worldviews inform this study or the research method used is an important assessment in this research process. As a health care professional with experiences using the EHR, preconceived biases related to the processes involved in EHR implementation could potentially influence the research findings. The characteristics of the researcher could also influence the participants of the study (Probst, 2015) as the research plan included interviewing other health care professionals, which could create biases relating to the knowledge base of both the research participant and the interviewer.

To mitigate potential biases, I maintained a reflexive journal by documenting awareness of personal experiences and views about the EHR system that could introduce bias and affected the interpretation of the information obtained and these views formed

part of the data analysis phase. Berger (2015) described reflexivity as a self-appraisal process in which the researcher recognizes and take responsibility for any personal awareness such as experiences and beliefs that could influence the research process. Cope (2014) noted reflexivity refers to the awareness that researchers' values, beliefs, and experiences can affect the outcome of the study, recommending researchers acting as the research instrument maintain transparency during the research process to reduce research bias. Darawsheh (2014) outlined the main outcomes of using a reflexive journal including maintaining transparency, making necessary alterations during the research process to ensure the credibility of the findings, and using personal subjectivity to perform an in-depth exploration and interpretation of the data. Using a reflexive journal facilitates the enhancement of the dependability of the research by documenting personal thoughts about decisions made during the research process (Probst, 2015).

Adhering to the ethical principles governing research is a critical component of the research process (Hammersley, 2015). The Belmont Report Protocol outlined research requirements grounded in the moral principles relating to conducting research involving human subjects and acts as a guiding framework for analyzing ethical issues associated with research (Miracle, 2016). The general principles outlined in the Belmont Report include (a) respect for persons, which applies to informed consent, (b) beneficence, which relates to assessing the risk vs. benefit, and (c) justice, associated with the selection of research participants (Miracle, 2016).

I respected the autonomy of the participants by asking participants to sign a consent form to obtain their permission to participate in the study and provided relevant

information regarding the risk and benefits associated with the research to ensure they made an informed decision. I maintained confidentiality of the participant by using the numerical coding system P1 to P5 to identify study participants. Beauchamp (2008) noted the importance of maintaining the participant's confidentiality and respecting their rights to refuse or withdraw without consequences. The participants selected did not include a vulnerable population. I used an interview protocol as outlined in Appendix A to promote consistency of the interview process and facilitate understanding of the strategies for implementing EHR. Yin (2014) recommended researchers use an interview protocol when conducting qualitative case study designs to promote the reliability of the research findings. An interview protocol consists of (a) an overview of the case study, (b) the procedures involved in the data collection process, (c) the research question, and (d) a guide for the case study report (Yin, 2014).

### **Participants**

Qualitative research involves the researcher establishing a set of operational criteria such as an inclusion or exclusion criteria to set a boundary around the population size (Robinson, 2014; Yin, 2014). I used a purposive sampling technique to identify participants knowledgeable in the implementation of EHR systems and have successfully implemented the EHR. Purposefully selecting participants with the expertise and experience in the research topic facilitates the collection of data that adequately represents the phenomenon under study (McIntosh & Morse, 2015). Koch, Niesz, and McCarthy (2014) explained the importance of intentionally selecting participants

knowledgeable about the phenomenon and who can provide rich, thick description of their experiences relating to the research topic.

Choosing participants who meet specific criteria such as those knowledgeable in the research topic, facilitate the collection of in-depth information (Palinkas et al., 2015). Cleary, Horsfall, and Hayter (2014) posited researchers select participants based on their knowledge and expertise relating to the research topic noting participant selection must align with the conceptual framework. I selected participants for this research who met the eligibility criteria including (a) health care leaders from one hospital located in one island in the Caribbean, (b) participants who have experience in successfully implementing the EHR system, and (c) participants willing to consent to an audio-recording of the interview session.

Gaining access to participants could result in a tedious, uncomfortable task requiring persistence and flexibility throughout the process (Peticca-Harris, deGama, & Elias, 2016). Creating a relationship of trust and respect could facilitate obtaining relevant information on how to gain access to potential participants and obtaining participants' permission (Hoyland, Hollund, & Olsen, 2015). Using professional affiliation, I identified and established a relationship with individuals who provided directions to qualified health care leaders with interest in the use of EHR systems. Mayorga-Gallo and Hordge-Freeman (2016) also highlighted the relevance of establishing credibility to promote access to participants.

Researchers noted the importance of establishing a relationship of honesty, trust, and respect by obtaining informed consent, respecting participants' autonomy, and

providing adequate information relating to the risk and benefits of the research (Hoyland et al., 2015; Yin, 2014). I provided the participants with accurate information about the study, the purpose, and the researcher's role in the process to create an open communication of trust and transparency. I established a relationship with the participants through an initial email introducing myself and provided information regarding the research goals and objectives. I adhered to the ethical principles of research as established in the Belmont Report (Miracle, 2016) by ensuring participants' protection during the research process, using the coding system P1 to P5 to identify participants, and provided adequate information about the risk and benefits, so participants could make an informed decision.

I provided a consent form for participants to sign upon expressing a willingness to participate in the study, and I informed participants of their right to refuse to participate in the study or withdraw at any time during the research process. I also sought approval from the Institutional Review Board (IRB) before making any contact with the participants or commencing the data collection process. The IRB plays a role in ensuring researchers follow the ethical and regulatory standards required when conducting research involving human subjects, to ensure the protection of research participants (Kawar, Pugh, & Scruth, 2016; MacCubbin & Moore, 2014).

## **Research Method and Design**

### **Research Method**

I used a qualitative research method to explore strategies health care leaders used to implement EHR systems. Qualitative research involves exploring and examining real-

life events to gain understanding and meaning of the lived experiences in a social and cultural context (Bailey, 2014). Qualitative research enables the researcher to immerse into the phenomenon under investigation to gain a rich, thick description of the research question (Cronin, 2014). Qualitative research facilitates the use of multiple data collection methods such as interviews and document reviews, facilitating an inductive approach of inquiry to gain an in-depth knowledge of the research phenomenon from the participants in their natural environment (Bristowe, Selman, & Murtagh, 2015). Kaczynski, Salmona, and Smith (2014) noted multiple data sources enables the linkage between the data and research findings necessary in conducting a robust qualitative study and promote a deeper understanding of the topic.

Using a qualitative case study facilitates an inductive inquiry into how and why a phenomenon occurs (Yin, 2014). Using a qualitative methodology facilitates an understanding of a phenomenon or process occurring in a complex and diverse environment where difficulty exists in measuring information such as participants' experiences (Bristowe et al., 2015; Jervis & Drake, 2014; Trainor & Graue, 2014). Braithwaite et al. (2014) highlighted the challenges of implementing changes in the health care system due to the complex and intricate nature in which the health care environment operates. Using a qualitative case study facilitated an understanding of the strategies and processes involved in the adoption and implementation of EHR systems in the health care environment.

In contrast, quantitative research involves examining variables numerically and using statistical inferences to understand and explain a phenomenon (Bristowe et al.,

2015). In quantitative research, the researcher uses a deductive approach with established standardized methods of inquiry to examine a phenomenon (Tavakol & Sandars, 2014). Quantitative researchers examine variables in a controlled setting by using hypotheses to test theories and use data collection instruments such as surveys and questionnaires to gather data objectively (Bettany-Saltikov & Whittaker, 2014; Probst, 2015; Tavakol & Sandars, 2014). The mixed method includes both a quantitative and qualitative component (Yin, 2014). Although researchers could find this method advantageous when exploring complex phenomenon, the analytic process involved in combining both the qualitative and quantitative data could be time-consuming and expensive and could result in a reduction in sample size or limitation in the number of interviews to offset budgetary constraints and managed time (McCusker & Gunaydin, 2015). I conducted an exploration of the strategies and processes involved in the implementation of EHR systems. I did not use the mixed method approach for this study as the quantitative portion was not necessary for conducting this research. Qualitative research facilitates the collection of data from participants with the knowledge and experience necessary to obtain an in-depth description of my research topic.

### **Research Design**

I used a case study design for my research. Researchers use the case study design to allow the researcher to examine the case through multiple lenses, which facilitates a better understanding of the phenomenon under study (De Massis & Kotlar, 2014). Researchers who use a case study approach engage with participants in personal interactions that will promote in-depth understanding of the meaning of a real-life event,

or the workings of organizational processes (Hyett et al., 2014; Yin, 2014). Morse and McEvoy (2014) also noted case studies facilitate the collection of rich data, promoting a greater understanding of the research phenomenon.

Researchers use the case study design to provide diversity and flexibility and facilitate designs that suit individual cases and research questions (Hyett et al., 2014; Ketokivi & Choi, 2014). Researchers who use the case study design can explore the multifaceted aspects of the phenomenon of interest (Cronin, 2014). Thus, utilizing the case study design facilitated understanding of the processes involved in adopting and implementing EHR systems in the complex environment of the health care system as the case study facilitated exploration of the phenomenon from different lenses. Ates (2013) opined case studies are best suited when researching complex events to gain a better understanding. Birchera and Kuruvilla (2014) noted the complexity of the health care environment highlighting the interconnectedness and multidisciplinary interactions required for the system to function as a whole. Other qualitative research designs considered for this study included phenomenological and ethnographic designs.

In phenomenological design, researchers seek to describe and understand the lived experiences through the subjective lenses of the participants' understanding of their experiences (Mayoh & Onwuegbuzie, 2015; Snelgrove, 2014; Sousa, 2014). Additionally, phenomenological research design facilitates a method of inquiry that enables the researcher to collect data in the participants' environment and based on the participants' description of their experiences (Mayoh & Onwuegbuzie, 2015; Sousa, 2014; Wagstaff & Williams, 2014). Phenomenological researchers use an interpretative



approach to understand the lived experiences of the participants (Clancy, 2013). Thus, through the process of bracketing, researchers recommended acknowledging and separating predetermined beliefs and experiences of the phenomenon to avoid influencing the participants' perspectives and allow for a more accurate presentation of the participants' subjective narrative (Bevan, 2014; Snelgrove, 2014; Willis, Sullivan-Bolyai, Knafi, & Cohen, 2016). I did not choose to conduct a phenomenological study as the objective of my research is not to understand participants' subjective experience. An ethnographic design was also not appropriate for my research.

In conducting ethnographic studies, researchers enter the world of the research participants to gain a deeper understanding of the participants' experiences and perceptions in the social context, and to identify the dynamics of the participants' lived experiences (Hallett & Barber, 2014; Marion, Eddleston, Friar, & Deeds, 2015). Ethnographic researchers conduct extended periods of detailed observations and interviews in the participants' natural environment to collect data (Yin, 2014). Marion et al. (2015) conducted an ethnographic study over 10 years examining the emergence of new products to determine entrepreneurs' use and development of inter-organizational relationships and the effect on the initiation and evolution of new products.

Yin (2014) also emphasized the extensive resources required to conduct the extended field work necessary in ethnographic research. The case study design was most appropriate for conducting this research as the intent of the study was to explore how an organizational process was adopted and implemented, and not to gain an understanding

of the subjective or lived experiences of the participants. Exploring all aspects of the phenomenon necessitate the achievement of data saturation.

Data saturation is an important element in qualitative case study design and is critical in ensuring research quality and validity (Elo et al., 2014; Fusch & Ness, 2015; Morse, 2015a; Morse, Lowery, & Steury, 2014). Data saturation occurs when the information the researcher receives becomes repetitive, all possible aspects of the phenomenon covered, and no further generation of information or new development of codes and themes occur (Fusch & Ness, 2015; Morse, 2015a). Tran, Porcher, Falissard, and Ravaud (2016) noted data saturation occurs at the point of diminishing return and the researcher can no longer identify new themes. Researchers posited the number of sample size for a qualitative research depends on the achievement of data saturation (Fusch & Ness, 2015; Morse et al., 2014). I ensured data saturation by continuing the interview process until the research participants present no new information.

### **Population and Sampling**

I used a purposive sample strategy to determine the participants for this research. Researchers described sampling in qualitative research as selecting specific data sources that allow the researcher to meet the research objectives and achieve depth and quality of the information collected (Gentles, Charles, Ploeg, & McKibbin, 2015). Palinkas et al. (2015) noted purposeful strategy is commonly used in qualitative studies in which the researcher seeks to achieve in-depth information regarding the research phenomenon. Yssel, Pak, and Beilke (2016) used purposeful sampling to recruit participants to gain insight regarding students' perceptions of their experience. Robinson (2014) posited

homogeneity of the sample universe increase with the addition of inclusion and exclusion criteria.

The study participants for this research included six health care leaders from one hospital located in one island in the Caribbean. Participants had experience in successfully implementing the EHR system. In addition, participants consented to audio-recording the interview session. I collected data from six participants using a semistructured face-to-face interview technique. Semistructured interviews consist of questions which facilitate open discussion rather than a yes or no answer, to enable the researcher to obtain subjective responses specific to the area of inquiry and the flexibility to ask probing questions (McIntosh & Morse, 2015). Doody and Noonan (2013) noted probing questions facilitate clarification of participant's responses and promote a deeper understanding of the research phenomenon. Jamshed (2014) described semistructured interviews as in-depth and widely used in health care research due to the open-ended nature of the semistructured approach.

Using a face-to-face interview technique enables the researcher to obtain additional information through social cues such as voice and body language, which can contribute to the verbal responses from the participants (Irvine, 2013). Face-to-face interviews facilitate both verbal and non-verbal interaction, thus, optimizing communication and enabling the researcher to clarify any questions or doubts the research participant may have regarding the interview questions and promoting more in-depth responses (McIntosh & Morse, 2015). I collected data until no new information emerged.

Mason (2010) noted researchers used data saturation to guide sample selection during the data collection process and posited data saturation drives sample size. Sample size varies widely in qualitative case studies with no commonly accepted criteria and driven mainly by the researcher's objective of the study (Elo et al., 2014). Determination of the appropriate sample size necessitates continuous evaluation during the research process and often approximated during the research planning phase (Malterud, Siersma, & Guassora, 2016). In qualitative studies, researchers can use smaller sample size as opposed to quantitative research, as the primary purpose of qualitative research relates to understanding the complexity, depth, or variation of the phenomenon (Gentles et al., 2015). In their study, Gibbons, Bhatia, Forbes, and Reid (2014) reach data saturation after conducting eight interviews. Sharp et al. (2014) recruited 17 participants and concluded the data collection with a total sample size of six participants. Robinson (2014) recommended a provisional number for determining resource allocation and suggested a flexible approach when determining the sample size. I selected a preliminary sample size of six participants.

### **Ethical Research**

The Belmont report outlines the ethical principles researchers should undertake when conducting research involving human subjects (Beauchamp, 2008). These principles include respecting the autonomy of the participant to consent to any participation in the study, informing participants of potential risk and benefits before obtaining informed consent, and maintaining the participants' privacy (Adams & Miles, 2013; Beauchamp, 2008; Nishimura et al., 2013; Speer & Stokoe, 2014). Respect for

participants' autonomy include providing the participants with adequate information about the study and the risk and benefits involved, to ensure participants' understanding of pertinent information about the research and their choice to accept or refuse to participate in the study (National Institute of Health, 2014). I provided the consent form to participants via email outlining the background of the study, consent process, risk and benefits, and contact details for refusal to ensure participants made an informed decision.

I informed participants their participation is voluntary and did not include a monetary incentive or compensation and they could refuse to participate or withdraw at any point during the process without penalty. Beauchamp (2008) noted the importance of respecting participants' right to refuse or withdraw without consequences. I asked participants to submit their refusal to participate in the study via the contact details provided in the consent form. Participants could withdraw from the study at any time during the research process. Participants could submit their request to withdraw from the study to me in person, via email, or telephone; I provided detailed information in the consent form. For participants who chose to withdraw from the study after the interview, I did not include the data collected in the final data analysis and destroyed the data by deleting the recorded interview and shredding written notes. I secured email correspondence on a password protected computer that is accessible only by myself. Adhering to the principle of confidentiality promotes the protection of the rights and dignity of the participants (Guraya & Guraya, 2014).

I sought approval from the Walden University IRB before contacting research participants, and the final doctoral manuscript contained the Walden IRB approval

number. Rodrigue, Feng, Johansson, Glazier, and Abt (2016) noted IRBs ensure researchers comply with the rules governing the protection of human subjects. Kuyare, Marathe, Kuyare, and Thatte (2015) also posited IRB members provide oversight of research proposals to ensure the protection of the rights and well-being of research participants. My doctoral manuscript does not include the names of the participants or the name of the organization.

I developed a coding system using the pseudonyms P1 to P5 to protect the confidentiality of research participants and their organization. Researchers highlighted the use of pseudonyms instead of participants' real name as a strategy to protect the privacy of research participants, and maintain their confidentiality (Hannes & Parylo, 2014; Maringe & Sing, 2014; Saunders, J. Kitzinger, & Kitzinger, 2014). Wolf et al. (2015) also noted researchers have an ethical and regulatory obligation to protect the confidentiality of research participants and suggested the use of a coding system or collecting data anonymously. I used the NVivo software to assist in the data analysis and in identifying recurring codes and themes from the data collected.

I stored all written research documents and hard drive in a locked file cabinet accessible only by myself, and the electronic data is secured on a password protected computer. I will store all data for 5 years then destroy by shredding written documents, breaking external drive, and deleting electronic files. I shared a summary of the research findings with the participants as part of the member-checking process. Member-checking promotes accuracy of the data and ensures the validity of the research findings (Cope,

2014). In their study, Allen and Wiles (2016) provided updates to participants and the transcripts sent to them for comments.

### **Data Collection Instruments**

I served as the primary data collection instrument, using a semistructured interview technique as the primary data source. I conducted the interviews from participants at one hospital in an island in the Caribbean. I also conducted a review of organizational documents including policies and procedures to gather information about the implementation and adoption of EHR systems. Analyzing organizational documents to corroborate the data obtained from other sources increases the understanding of the research phenomenon and enhances the validity of the study findings (Pacho, 2015). Reviewing specific documents facilitates the convergence of the data, and the authentication of the research findings (Johnson et al., 2017; Yin, 2014).

Collecting data for qualitative case studies require the researcher use multiple data collection sources to strengthen the credibility of the research (Yin, 2014). Triangulation of the data using multiple sources such as semistructured interviews and analysis of EHR policies and procedures maximizes the potential to gain rich, in-depth perspective of the phenomenon and completeness and accuracy of the data (Fusch & Ness, 2015; Hays, Wood, Dahl, & Kirk-Jenkins, 2016). Triangulation of the data source can enhance the credibility of the research findings (Carter, 2014). Cho and Lee (2014) also noted triangulation of the data using multiple sources minimizes researcher bias and the possibility of misinterpretation of the findings. Paradiso de Sayu, and Chanmugam (2015) used several data sources including semistructured interviews and document

review including published articles, and reports to gain comprehensive knowledge of the topic under study. Elo et al. (2014) noted ensuring trustworthiness of the data begins with the choice of data collection to explore the phenomenon.

I conducted semistructured, face-to-face interviews to facilitate gaining participants' complete perspectives in the implementation of the EHR systems. Conducting semistructured face-to-face interview enables the researcher to engage in a natural interactive and subjective relationship with the research participant, which can generate rich data (Aleandri & Russo, 2013; Irvine, Drew, & Sainsbury, 2013). The interview method is the most common data collection instrument used in collecting evidence for qualitative case studies, and the researcher acts as the primary research instrument (Collins & Cooper, 2014; Yin, 2014). In conducting semistructured interviews, the researcher obtains subjective data from the research participants using a guided line of inquiry and probing conversational questions to elicit responses to gain an in-depth knowledge of the research phenomenon (McIntosh & Morse, 2015; Yin, 2014). I asked each research participant the same questions to maintain consistency and facilitate trustworthiness of the data. To enhance the reliability and validity of the research instruments, I also used the member checking strategy. Member checking refers to participant validation of the research findings and involves the researcher returning the transcribed or preliminary data to the participants to verify the accuracy of the data (Birt, Scott, Cavers, Campbell, & Watler, 2016; Cho & Lee, 2014).

I used an interview protocol as outlined in Appendix A, as a guide in the data collection process. The interview protocol includes information relating to the research



purpose, process, and research question. Yin (2014) noted a case study protocol contains the general rules and procedures the researcher follows in collecting data. Developing an interview guide contributes to the trustworthiness of the data (Kallio, Pietila, Johnson, & Kangasniemi, 2016).

### **Data Collection Technique**

I obtained permission from the organization to collect the research data for this study using professional affiliates. The data collection technique included face-to-face semistructured interviews using the interview protocol outlined in Appendix A as a standard guide in the data collection process. Yin (2014) noted a case study protocol contains the general rules and procedures the researcher follows in collecting data including (a) an overview of the research, (b) data collection procedures, (c) data collection questions, and (d) guide for the case study report. The data collection process also included a review of organizational documents. Triangulation of the data facilitates comparison of the information collected and ensure the credibility of the study findings, and a deeper understanding of the research phenomenon (Fusch & Ness, 2015; Morse, 2015b).

Using a semistructured interview technique facilitate the flexibility to diverge from the predetermined questions, enabling the researcher to ask probing questions and the participant to elaborate beyond the initial response, thus, introducing information freely and rendering the collection of rich data (McIntosh & Morse, 2015; Morse, 2015c). Semistructured interview techniques aid the researcher in successfully conducting the interview and contributing to the trustworthiness of the research findings (Kallio et al.,

2016). However, research participants may not always provide indepth responses to the interview questions (McIntosh & Morse, 2015) and the process could result in time-consuming challenges for researchers (Kristensen & Ravn, 2015).

After completing the interview sessions, I conducted a review of organizational documents including EHR implementation policies and procedures to determine congruence of the data. I obtained permission from the organization before reviewing the documents. Yin (2014) noted the relevance of documents in collecting data for case studies and argued documents can provide additional information to help the researcher corroborate data gathered from other sources. Reviewing specific documents facilitates the convergence of the data, and the authentication of the research findings (Johnson et al., 2017). Document review increase the understanding of the research phenomenon and increase the validity of the study findings (Pacho, 2015). However, Yin (2014) noted triangulation of the data using multiple sources could result in greater expense for the researcher and could pose a bigger challenge for novice researchers with less knowledge on how to conduct data triangulation. Additionally, triangulation of the data using document review could result in inconsistencies between the recorded and reported data (Rassi, 2016). If analysis of the data yields different results, the researcher could consider reframing the research question or reconsider the methods used (Carugi, 2016).

I used the member-checking validation tool to minimize bias and ensure the accurateness of the data collected. Member-checking as a validation tool involves the researcher verifying with the participants, the accuracy of the data collected. I transcribed the data after completing the data collection process by listening to the audio recordings

of each research participant and documenting the data in a word document. Fenn, Sangrasi, Puett, Trenouth, and Pietzsch (2015) recorded interviews and group discussions and transcribed the data during and after the data collection process. I conducted follow-up interviews with the participants, providing them with a summary of the transcribed data to obtain affirmation of the accuracy of the transcribed data. Birt et al. (2016) described the various processes involved in member-checking including returning the interview transcript to the participants or conducting a follow-up interview to review the transcribed or analyzed data. Using strategies such as member-checking facilitate validation of the data collected or provide additional research data (Morse, 2015b). Researchers use the member-checking process to verify transcribed data (Simpson & Quigley, 2016) and validate the interpretation of the data to enhance the integrity of the data analysis (Van Schaik, O'Brien, Almeida, & Adler, 2014). I provided participants with a copy of the research findings for their personal information.

### **Data Organization Technique**

I used the digital software, NVivo, to organize my research data. Using software such as NVivo facilitates sorting, organizing, and classifying of the data to enable the interpretation of the data to answer the research question and makes retrieving the data easier (Castleberry, 2014). While the NVivo software facilitates the organization of codes and themes, the identification of the codes and themes, and the interpretation of the data remains a function of the researcher (Zamawe, 2015). I entered the codes and themes identified during the analysis phase into the NVivo software to facilitate organization and analysis of the research data. Gale, Heath, Cameron, Rashid, and Redwood (2013) noted

the use of analysis software in efficiently storing and organizing qualitative research data for easy access during the analysis process. Pinfield, Cox, and Smith (2014) described the relevance of organizing research data noting organization of data occurs throughout the life cycle of the data, including the creation, storage, security, and preservation of the data and research findings.

I developed a numerical coding system using P1 to P5 to match the identity of the participants with individual responses to facilitate confidentiality of the participants. Saunders, Kitzinger, and Kitzinger (2014) highlighted the importance of keeping participants' identities confidential. Researchers developed procedures including the use of a numerical coding system to ensure confidentiality and protection of participants' and organizations' identity (Alves, Amorim, Fraga, Barros, & Silva, 2014; Cook et al., 2014).

I used reflexive journaling to document thoughts and findings pertinent to the research process during the interview sessions. Conducting reflexive journaling promote awareness of researchers' beliefs and assumptions (Ripamonti, Galuppo, Gorli, Scaratti, & Cunliffe, 2016), which can influence the participants' responses and contribute to a bias presentation of the research findings. Cope (2014) argued the practice of reflexive journaling promotes awareness of the researcher's values, background, and experiences, which can affect the research process through the introduction of researcher bias. In maintaining a reflexive journal, the researcher can gain a sense of renewed perspective in better understanding a particular situation by engaging in self-questioning (Cowan, 2014). Elo et al. (2014) noted evaluation of the data and critical assessment of the

researcher's actions through continuous reflection support trustworthiness of the research findings.

I stored all written research documents including reflective journal, and external drives in a locked file cabinet accessible only by myself, and the electronic data is secured on a password protected computer. I will store all data for 5 years then destroy all files by shredding written documents, breaking external drive, and deleting electronic files. Yin (2014) noted the primary objective of organizing and storing research data including written documents relates to ease of retrieval for inspection and perusal if necessary. Alves et al. (2014) described a storing and filing process including the storage of all research data in a locked file cabinet and the retention of interview transcript for 5 years. Akers and Doty (2013) highlighted the use of computers and external hard drives as a standard method for storing or backing-up research data.

### **Data Analysis**

The process of analyzing and interpreting qualitative research data involves several steps to understanding and making sense of the data. Although varying techniques exist for conducting the analysis process, the common premise includes deconstructing and reconstructing the volume of data collected to identify codes and themes to facilitate interpretation and understanding of the participants' views and experiences (Bengtsson, 2016; Cho & Lee, 2014; Noble & Smith, 2014). Yin (2014) suggested playing with the data as a starting point with an objective of searching for patterns, insights, or concepts. Elo et al. (2014) recommended using the approach of (a) preparing the data for analysis, (b) coding and organizing the data to identify themes and patterns, and (c) interpreting

and reporting the results. Bengtsson (2016) described four stages for analyzing the data, which include decontextualization, recontextualization, categorization, and compilation. These stages involve the researcher becoming familiar with the data and identifying units or codes; checking the data to ensure all aspects of the content have been covered in relation to the research goal; identifying themes and categories; and organizing and eliciting meaning from the data to draw realistic conclusions (Bengtsson, 2016).

I conducted a content analysis of the data collected from the recorded face-to-face semistructured interviews of the research participants using the four stages of analysis described by Bengtsson (2016). First, I conducted a verbatim transcription of the interview recordings to facilitate immersion into the data and read the transcribed data to achieve familiarity with the data and gain an understanding of the information presented by the participants. Reading through the transcribed data enables the researcher to gain a sense of the whole before identifying smaller units (Bengtsson, 2016). Gale et al., (2013) highlighted the importance of gaining familiarity with the interview using audio recording, transcript, and any other data collected; and conducting a verbatim transcription of the audio recordings to facilitate immersion into the data. The audio-recordings facilitate verification of any discrepancies identified during the analysis phase Giduthuri et al. (2014). Next, I cross-checked the audio recordings and transcribed data for accuracy to ensure the data collected adequately answers the research question.

Third, I developed a pre-coding system using P1 to P5, matching the interview questions outlined in Appendix B with the participants' responses. Coding the data enables classification of the data and comparison of other aspects of the data set (Gale et

al., 2013). I then conducted triangulation of the data to ensure the credibility of the research findings by examining documents related to the EHR implementation process such as organizational policies, procedures, and reports, as well as notes from the reflexive journal. Triangulation of the data using multiple methods to collect data can facilitate a deeper understanding of the research topic and supports the validity of the research findings (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014; Morse, 2015b). Next, I reviewed and coded the data collected from the written documents, and from the notes of my reflective journal to get a sense of the underlying meaning of the information presented and compare with the themes developed from the interview transcript.

I used the digital software, NVivo 10, to facilitate analysis of the research data collected from the research participants, organizational reports and protocols, and my reflexive journal to gain an understanding of the strategies employed by health care leaders to implement EHR systems. Researchers described NVivo as a tool used to sort and organize research data and facilitate the analysis of the data and understanding of the phenomenon under study (Gould et al., 2014; Sotiriadou, Brouwers, & Le, 2014). I organized the data utilizing the NVivo software to identify codes and grouped similar and recurring patterns into identified themes to aid in the interpretation of the data and facilitate an understanding of the EHR implementation process.

Computer assisted qualitative data analysis tools such as NVivo, facilitate the management, organization, and analysis of data (Sotiriadou et al., 2014). Hays et al. (2016) used a coding system during the data collection and analysis process to facilitate

linkages between data set and achievement of a comprehensive and consistent list of variables. Wong, Lavoie, Browne, MacLeod, and Chongo (2013) used an interpretative thematic process in the coding and analysis of data to identify strategies relating to confidentiality issues within group medical visits. Gould et al. (2014) combined selective and open coding methods in their data analysis process. Vaismoradi, Turunen, and Bondas (2013) described content analysis and thematic analysis as analytical strategies used in qualitative research. I explored the data derived from the transcribed interviews and documents to address the research question.

### **Reliability and Validity**

An important element in conducting qualitative studies relates to establishing the reliability and validity, or the quality and trustworthiness of the research (Morse, 2015b; Noble & Smith, 2015). Zohrabi (2013) noted researchers should consider the validity and reliability of the research before and after the data collection process. Researchers can establish reliability and validity by ensuring the research is credible, dependable, confirmable, and transferable (Lincoln & Guba, 1985). Researchers used recognizable techniques to ensure reliability and validity of the research such as member-checking, triangulation, reflexivity, and obtaining a rich description of the phenomenon through achievement of data saturation (Cope, 2014; Morse, 2015b).

### **Reliability**

The objective of establishing reliability or external validity of the research is to generate similar results and conclusion of the study if another researcher should replicate the research using the same procedures (Morse, 2015b; Yin, 2014). Hlady-Rispal and



Jouison-Laffitte (2014) noted researchers demonstrate external validity when replication or transferability of the findings can occur. Zohrabi (2013) argued establishing the reliability of the study results is an important criterion for the research process.

Yin (2014) noted the goal of establishing reliability in qualitative research refers to the trustworthiness of the research. Power and Gendron (2015) described reliability as a constant checking and rechecking of the data to ensure correct interpretations of the results. Leung (2015) recommended constant data comparison and consistency of the research process as tools for ensuring reliability. Grossoehme (2014) opined documenting the research process is a prerequisite for ensuring reliability in qualitative research and facilitates the replication of the study findings by other researchers using the same procedures. In qualitative research, reliability refers to the dependability of the research (Palinkas, 2014).

### **Dependability**

Dependability in qualitative research refers to the stability and consistency of the research findings over time to yield similar results with replication of the study (Grossoehme, 2014; Hays et al., 2016). The researcher can establish dependability using techniques such as an audit trail or maintaining a reflexive journal (Noble & Smith, 2015). I used reflectivity as a strategy to achieve qualitative rigor and dependability of the research findings. Darawsheh (2014) highlighted the importance of reflexivity in establishing rigor in qualitative research, noting the use of reflexivity improves transparency of the researcher's subjectivity and prevent the introduction of personal bias that could affect the research findings. Maintaining a reflective journal involves the

monitoring of the researcher's thoughts and assumptions throughout the research process, which could enhance the dependability of the findings (Hays et al., 2016). Garside (2014) described the relevance of reflexive documentation in establishing dependability of the research.

### **Validity**

Validity refers to how accurately the research findings reflect the participants' subjective description of the phenomenon (Elo et al., 2014; Sousa, 2014). Validity represents the internal validity of the study, and in qualitative studies, described as credibility, transferability, and confirmability of research results (Morse, 2015b). Researchers establish validity through demonstration of the integrity of the research, congruence of the methodological process, and accuracy of the interpretation of the study findings (Leung, 2015; Noble & Smith, 2015).

Congruence as an element of establishing validity relates to the connectedness of the research question with the method, the data collection with the analysis, the current study with the literature review, and the research findings with the implication of the study (Cope, 2014). Yin (2014) noted failure to establish the foundation of the study during the design phase, can affect the analysis phase of the research. Morse (2015b) noted the subjectivity of the data, the unstructured data collection process, and the interpretive nature of the analysis contribute to threats to research validity. Researchers can establish internal validity by acknowledging researcher bias through self-reflexivity, triangulating the data using multiple sources to analyze and describe the findings, and allowing the participants to verify the researcher's interpretation of the data through

member-checking to ensure accurate representation of participants' perspectives and intended meaning (Green, 2015; Hays et al., 2016; Hlady-Rispal & Jouison-Laffitte, 2014). I used member-checking, data triangulation, and reflexive journaling techniques to establish validity in this research.

### **Credibility**

Credibility in qualitative research refers to the truthfulness or internal validity of the data, and the accuracy of the researcher's interpretations of the information presented by the participants (Cope, 2014). Hammarberg, Kirkman, and de Lacey (2016) referred to credibility as an evaluative criterion to assess the truthfulness of the data and the interpretation of the findings and occurs when research participants who share the experience under study can recognize the results of the content description. I established the credibility of my research by using member-checking to validate my research findings. Member checking involves asking the participant to check the transcribed interviews to enhance the accuracy of the data collected (Birt et al., 2016). In conducting member-checking, I provided the participants with the transcribed data after each interview session to allow the participants the opportunity to correct any discrepancies in the data collected during the interview process. Conducting member-checking ensures the interpretation of the data accurately reflects the participants' experience (Harper, 2015). This process of validation can facilitate confirmation, modification, and verification of the data to ensure the accuracy of the research findings (Birt et al., 2016). Member-checking also enables the researcher to recognize potential biases, enhancing the validity of the research findings (Caretta, 2016; Kornbluh, 2015; Morse, 2015b).

Credibility also refers to the suitability of the data collected for analysis and using the best data collection method to answer the research question to enhance the trustworthiness of the data (Elo et al., 2014). Zohrabi (2013) highlighted the relevance of obtaining data from participants knowledgeable in the research topic. I collected data using face-to-face semistructured interviews from participants with experience in implementing the EHR system, which facilitated the collection of rich data to help answer the research question. McIntosh and Morse (2015) noted the flexibility of semistructured interviews enables the researcher to ask probing questions, which can facilitate the collection of extensive information from the participants.

### **Transferability**

Researchers emphasized the difficulty in transferring qualitative research findings to other settings or groups and noted the audience or reader decides whether the results meet the transferability criteria (Sarma, 2015). Cope (2014) noted transferability occurs when readers associate the research findings to their settings and the results have meaning to persons not involved in the study. I demonstrated transferability of the research findings through the description of the data collection process, adhering to the interview protocol listed in Appendix A, and providing adequate information to promote the interpretation of the results.

I used a purposive sampling technique to promote the collection of rich data from participants knowledgeable in the implementation of EHR systems. Elo et al. (2014) highlighted the suitability of purposive sampling in qualitative studies to obtain information from participants knowledgeable in the research topic. Lub (2015) noted the

importance of providing a thick description of the data collection process including the setting, participants, context, and actions to promote transferability of the findings. Lewin et al. (2015) highlighted the necessity of providing detailed and appropriate contextual descriptions to facilitate proper interpretations of the applicability of the findings. Crowe, Inder, and Porter (2015) noted transferability occurs when the researcher provides adequate information for the reader to assess the findings with their practice environment.

### **Confirmability**

Researchers demonstrate confirmability when the data represents an accurate description and reflect the views of the participants and not the perspectives of the researcher (Cope, 2014; Noble & Smith, 2015). To ensure confirmability of the research findings, I maintained a reflective journal to promote transparency and reduce personal biases; conduct member-checking; and use triangulation of multiple data source. Using multiple data sources and conducting member-checking promotes confirmability of the research (Hays et al., 2016). Rapport, Clement, Doel, and Hutchings (2015) recommended linking the data findings to the participants' responses instead of the researchers' assumptions. In establishing confirmability, Mikkonen, Kyngas, and Kaariainen (2015) maintained objective questioning during the interview process and avoided asking leading questions. I asked all research participants the same set of semistructured questions.

**Data Saturation.** I ensured data saturation to facilitate adequacy of the data collection to gain in-depth information to answer the research question and demonstrate the validity of the research. Tran, Porcher, Tran, and Ravaud (2017) noted achieving data

saturation ensures the researcher obtain adequate data to answer the research question and is reached when additional information can no longer change the researchers' interpretation of the phenomenon under investigation. Data saturation occurs when the researcher can no longer obtain new information during the data collection process and all possible aspects of the research topic covered (Fusch & Ness, 2015). Data saturation influences the sample size and saturation occurs when the data no longer reveals new themes or codes (Morse et al., 2014).

### **Transition and Summary**

In Section 2, I described the research process including the methodology and design of the study and an outline of the reasons for choosing the qualitative case study design to explore strategies health care leaders used to implement EHR. Section 2 also included the process for selecting potential participants to ensure chosen participants are knowledgeable about the research topic as well as the ethical considerations involved in ensuring the protection of research participants. In addition, Section 2 included the techniques for collecting, storing, and organizing the data as well as outlining the strategies and tool I used in the analysis process to identify themes and codes to help answer the research question. Section 2 also contained strategies for establishing the reliability and validity of the research including triangulation, member-checking, and reflexive journaling. In Section 3, I included the research findings based on the analysis of the data, the application of the research findings to professional practice, and the implications for social change. In addition, Section 3 contains recommendations for action, recommendations for further research, and reflections and conclusion.

### Section 3: Application to Professional Practice and Implications for Change

#### **Introduction**

The purpose of this qualitative single case study was to explore strategies health care leaders use to implement EHR systems to reduce health care costs. I used a purposive sampling technique to collect data from six health care leaders from one hospital in an island in the Caribbean who were involved in the implementation process. I collected the data via a face-to-face semistructured interview technique until I achieved data saturation, following the interview protocol outlined in Appendix A, and triangulating the data by reviewing policies and procedures relating to the implementation process. The interviews were conducted in a location chosen by the participants and at a time convenient for them.

During the analysis of the data, seven themes were identified and include training, increased staffing, monitoring, identifying organizational gaps, and time as major themes; and sensitization and vendor selection as minor themes. All participants unanimously identified training, time, identifying organizational gaps, and monitoring and evaluation as key strategies in the successful implementation of the EHR system. The present findings supported existing findings regarding the effectiveness of the EHR system in terms of efficiency, patient safety, and health outcome. The participants indicated the system was funded by the government and they noted cost as a deterrent for implementing the full EHR system. In Section 3, I include the presentation of the research findings, applications to professional practice, implications for social change,

recommendations for actions, recommendations for further research, reflections, and the conclusions of the study.

### **Presentation of the Findings**

In this research, I sought to answer the research question regarding the strategies that health care leaders use in successfully implementing EHR systems to reduce health care costs. I used a purposive sampling technique to identify and select six participants from a hospital in the Caribbean who had the experience and success in implementing the EHR system and from whom I could obtain data to answer the research question. I conducted member checking to ensure I accurately transcribed and interpreted the data collected. During the member checking process, I received feedback from one participant indicating a minor correction. I aligned the analysis of the data with the Bengtsson four stages for analyzing the data, which include decontextualization, recontextualization, categorization, and compilation of the data and becoming familiar with the data to identify themes and categories as well as organizing and eliciting meaning from the data to draw realistic conclusions (Bengtsson, 2016). I manually analyzed the data collected from the document review and face-to-face interviews which yielded seven major themes, outlined in Table 1.



Table 1

*Grouped Data and Emergent Themes*

Grouped data	Theme names
<p>Training was a massive undertaking. There were a lot of people to train.</p> <p>There had to be a number of steps involving training and getting all the stakeholder buy in.</p> <p>Identified individual staff training needs.</p> <p>Assessment of the staff training needs. What do they know about computers? Are they happy on a keyboard? Can they find their way around a screen? Or can they learn? Some older folks did not have a lot of exposure to computers.</p> <p>There were several weeks of staff training</p> <p>We developed a personal training plan for each individual. Then the actual training of people in the basic operation of a computer. The system was already built around roles and each individual was identified by role so that was also effectively their training profile.</p> <p>In addition to training the staff on the module.</p> <p>Training was centered on the modules and staff fall into the role because of their job title.</p> <p>Various training modules were used to do the training of the staff in the various components.</p> <p>Classrooms were built and outfitted with tables and workstations dedicated to</p>	<p>Training</p>

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training.

In the training environment people could go in and make mistakes.

Planned classroom hours. Provided individual and department specific training.

Building really detailed training material that was focused on specific processes and objectives.

Use of webinars and training modules.

Trained superusers to provide training and support for end users. Superusers were assigned to each group to provide support to end users.

Engagement of business analysts. Database analysts were trained by the vender and were involved in the build process of the system.

Several trips to the vendor headquarters. Worked closely with the vendor.

The magnitude of the implementation was going to require a lot more people on the project full time.

Increased Staffing

Development of the human resources.

A lot of additional staff.

Putting the right human resources in place.

We had to have an analyst for RadNet, PathNet, and CareNet.

So, the first thing we did was we hired a set of business analyst.

Using subject matter experts – Business

analysts who know the system inside out. They have both the knowledge of the end user and the knowledge of the system.

Create the positions for the database analysts.

Database analysts were assigned to each module/component of the system.

Database analysts provided support for the superusers and coached and mentored them.

Every business analyst was deployed to the units.

We had IT analysts for each section of the medical record.

So, the super users liaise with the IT analyst responsible for that section.

Super users from different department were assigned to IT.

Super users were deployed in their sections and were available to assist all the staff.

There was continuing monitoring and re-education. They had to put in place various strategies to monitor users and what was happening with respect to how the users were using the system.

Monitoring

This monitoring, whereas it was implemented early it is continuous where we have certain analysts who would analyze usage to see how many persons were being compliant with respect to putting the notes in the EHR.

The analysts along with other staff within the IT department monitored usage.

To support user compliance, we did audits and managers were charged with double checking documentation. Just all hands on deck to monitor documentation was probably the greatest strategy, the audits and monitoring.

We were auditing the quality of the document plus the flow and the integration. IT and senior management were able to monitor access to patient's files. So, to be able to use the record, you had to be assigned a position. If you do go into the system and go to someplace where you're not supposed to be, it is easy to check and see if you actually went there.

Before you could log into the system, you had to be assigned a username and a password from IT and you're not supposed to go in under anybody else's username. And so, all of that was put in place and continuously monitored.

So, it's really a monitoring system. Having various structures and systems in place that would prevent deviant access of personal records. Once you open the notes in the EHR system, a paper trail or a footprint is left there.

IT had to put in place certain firewalls. Management also spot checking the notes to see who went into the notes. We make sure that is not accessible to everyone who wants to have access to it.

A relationship must be established as to why you went into the notes. Management also spot checking the notes to see who went into the notes.

A lot of audit around patient's records. Periodic, random audits were done by the

managers and the IT staff.

An IT analyst was actually assigned who would do random audits. That was the analyst job every day to pick a certain number of records, and just randomly audit them.

On a larger scale, IT monitor intrusion into the system. But that's broader, IT is looking at attacks from the outside, cyber security.

Looked at the gaps that existed within the organization.

### Identifying Organizational Gaps

persons grouped according to their needs. Conducted surveys.

The gaps were identified.

Assessment of the staff training needs. What do they know about computers? Are they happy on a keyboard? Can they find their way around a screen? Or can they learn? Some older folks did not have a lot of exposure to computers.

Early on, we very quickly realized that a project of this magnitude was going to require a lot more people on the project full time.

Try and figure out who's not only knowledgeable in their primary subject matter, but who's going to be able to take on a computer-based role and learn a system that they have never seen before. Getting that right mix of clinical aptitude, and the willingness to learn on an IT system is crucial to the success.

In addition to training the staff on the modules, and how it was going to interface with each other, and how it was going to

change the patient flow and how they did business on a day to day basis, we had to really assess each individual as to where they were at with the computer skills because before that time it was only pen and paper.

Cost and finance limited the implementation of the full EHR system and as a result the implementation was done in stages or modular format. More cost effective to have done it all in one block.

There was a budget component for buying the system and everything that goes with it. All of the different bits and pieces that were needed after go-live date to make the system run smoothly. The whole implementation was very pricey, because the product was pricy.

There was also infrastructure that had to be put in place – hardware and software and the logistics of setting up. A whole fleet of new equipment including computers were purchased. Backup resources for servers and the server room.

Had to keep the resources available. Putting the right human resources in place  
Using subject matter experts – Business analysts who know the system inside out. They have both the knowledge of the end user and the knowledge of the system.

Some felt doing the implementation in stages allowed the organization time as it gets accustomed to the system.

Implementation needs to be process and objective driven. Every hospital is a little bit different. Workflows are different. Roles may differ from one hospital to the next.

A timeline was set up so that each section was ready for the implementation. Time

Components for the EHR system was implemented at different phases.

The time it takes for the implementation was probably not appreciated.

Having an implementation schedule.

Set out a full schedule for the implementation.

Specific time setup for various sections of the record.

Allowed a period of time to use the system of handwriting.

It was a crunch right down to the last minute.

The timeline was 2-3 years.

Went live on the target date.

Over a period of time other modules were purchased.

Additional modules were later implemented and is ongoing.

Where they had to have adequate sensitization of the staff regarding the need for the change and the need for the move away from paper to electronic recording and getting the staffs by-in. Sensitization

The sensitization of the staff started and even before full implementation what we did first of all was some sensitization sessions.

One of the things that happened early was sensitization. There was sensitization training. Sensitizing and re-sensitization of all the staff.

What we did was general sensitization session.

All of the staff would have gone through that sensitization training.

We also include members of the public to give us feedback. And then of course, we did sensitization to the public.

But I think the training and the hospital wide sensitization was really important.

You would have had to do sensitization session and training for all of them.

There was sensitization.

A Vendor selection process was conducted to identify the ideal EHR system in which the organization looked at what was required and what was on the market.

Vendor Selection

There was a lot of research regarding which product to purchase. So, I would say doing the research and involving a lot of people in the selection.

Initial search of the different EHR systems available.

Having looked at the different systems and sort of looking at what we do here, they made the assessment as to what might be best for us.

Determining which system had proven record of success.



Selection of the best and suitable system.

Identifying what products were available.

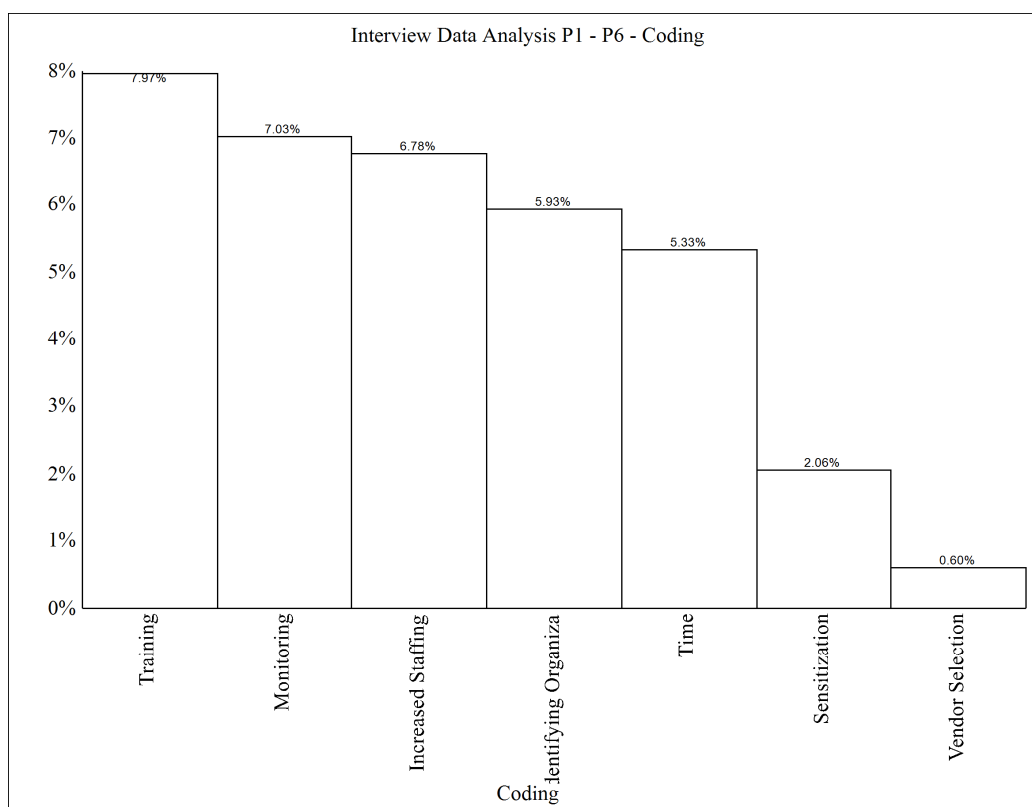
After manually analyzing the data and identifying codes and themes, I used the NVivo software to corroborate the data from the manual analysis and to organize the data and determine the percentage coverage of the themes as identified in Table 2 and Figure 1 and to create a visual of the identifying themes as indicated in Figure 2.

Table 2

*Number of Occurrences per Theme*

Theme name	References coded	% coverage
Training	56	7.97
Increased staffing	50	6.78
Monitoring	49	7.03
Identifying organizational gaps	45	5.93
Time	45	5.33
Sensitization	15	2.06
Vendor selection	8	0.60

*Note.* References coded indicate the number of data references that was coded to the identified theme and the % coverage indicates the percentage of the data file that the coding represents (NVivo 12, QRS International, n.d.).



*Figure 1.* Graft indicating the coding references and percentage coverage of the interview data. The chart reflects the themes identified in the analysis of the data. The five major themes identified include, (a) training, (b) monitoring, (c) increased staffing (d) identifying organizational gaps, and (e) time and minor themes include sensitization and vendor selection. Created from NVivo 12, QRS International.



*Figure 2.* Word cloud indicating the word frequency of the interview data. The word cloud reflects the themes identified in the analysis of the data including three of the major themes identified in the analysis of the data and include (a) training, (b) staffing, and (c) time. Created from NVivo 12, QRS International.

### **Theme 1: Training**

A key strategy identified in the data was training. The participants unanimously identified training as one of the most important strategy in the successful implementation of the EHR system. Although the participants indicated a reliance on the vendor to aid in the training of the staff, significant emphasis was placed on training at the organizational

level due to staff's limited computer skills at the time of implementation. Therefore, classrooms were created, and classroom training hours incorporated into the implementation timeline. The training involved training of database analysts and super users, as well as all end users. The super users included staff who were selected from the various departments and trained to provide IT support and assistance during the EHR implementation phase.

Previous studies revealed similar findings. Ross et al. (2016) identified training and education as a facilitator to the implementation of the EHR and a critical success factor but noted it could also pose as a barrier if absent or inadequate. P6 noted, "training...was a massive undertaking as well. And we had to build a few classrooms because you have a lot of people to train..." Bushelle-Edghill et al. (2017) also noted before the implementation of the EHR system, health care organizations should place greater emphasis on end user training to realize the full benefits of the use of the EHR. P1 noted, "...even before full implementation, there were several weeks of staff training, where various training modules were used to do training of the staff in the various components of it, and it was all the end users that were trained."

The findings also revealed the importance of identifying individual staff training needs at the early phase of the planning process and the relevance to the successful implementation of the EHR system. The training requirements described by the participants included basic computer training due to the staff's limitation in computers skills. P4 expressed,

There were many people who never turned on a computer, so we had to start with

very basic computer training...as to what the parts were, what's the monitor...and that started...the same time as...the actual training of the database analyst...

As noted in the review of the organizational documents, the project plan included the relevant elements of the training process to meet the training needs of the staff such as defining the participants, develop end user training material, ordering technical manuals, scheduling workshops and workshop agendas, scheduling classroom access, and providing initial application education for each module. Additionally, the plan included a timeline for training testers and super users.

The findings of this study are in keeping with results from other research which highlighted the necessity to ensure staff are comfortable with the use of the EHR and the inclusion of adequate training to promote successful implementation. Baumanna et al. (2018) emphasized the importance of sufficient training when considering implementation of the EHR, to enable staff to be comfortable with the new EHR and promote acceptance of the system. The findings from the data also corroborate with other researcher's arguments regarding ensuring a successful training plan. As highlighted by Lopez et al. (2018) factors contributing to a successful training program include on-sight and face-to-face instruction, training that involves hands-on application of practices, and using training topics tailored to the needs of the trainees. Participants' responses and review of the data reflected significant emphasis on developing a training plan to meet the needs of the end users. Crowley et al. (2019) recommended a carefully crafted training program pre-implementation, focused on tailoring training to the distinct role of the users, competencies, and tasks to ensure effectiveness of the training. The data

revealed training tailored to individual staff needs as described by P1 who noted, "...they were tailor made training sessions that were specific or department specific as well." In managing change such as the change necessary when implementing EHR systems, Clark et al. (2017) presented key areas of focus including attending to learning and noted the need to mentor and provide ongoing staff training opportunities to support technical capacity during the change process.

Vendor involvement in the training process was also critical to the successful implementation of the EHR system. P6 indicated heavy reliance on the vendor for the training of the database analysts who were involved in the build phase of the EHR system, requiring many trips to the vendor headquarters for onsite training. In the review of the documents, the scheduled timeline of the project plan reflected the logistics for the staff training sessions at the vendor site including developing agendas, finalizing attendees, and arranging travel plans, indicating the involvement of the vendor in the training process. Training requirements also included training on the security of the system as noted in the review of policy documents, which reflected, "Security awareness training shall provide Workforce Members with sufficient training and supporting reference materials to enable them to protect...Information Systems...[and] Classified Information." The project plan also showed a timeline for the "Review [of] existing security policies, sign-ins, [and] physical access."

The data revealed the training needs differed among staff members, requiring assessment and planning to ensure each staff receive the necessary training to facilitate the EHR implementation. Complex environment such as health care organizations

consists of many different players with many different needs (Mason et al., 2017).

Transformation relating to process changes such as those relating to the EHR implementation requires a balance between the organizational objectives and recognition of the needs of the individual players in the complex health care environment. Individuals in a CAS acts in unpredictable ways and make up the whole organization through a network of interactive and interconnected processes of a complex system (Ekboir et al., 2017). Therefore, exploring users' acceptance and use of the EHR system plays an importance role in promoting transformation and facilitating successful EHR implementation (Mason et al.). Transformation in the complex health care organization necessitates embracing the changes that can arise in a complex system (Khan et al., 2018). In the current technological environment, the computer training needs may be different. However, health care leaders could benefit from the strategy of identifying staff training needs to guide the staff training process.

### **Theme 3: Increased Staffing**

The participants recognized increasing the staffing level as a key strategy for the success of the EHR implementation process, in particular an increase in the IT staff as the existing IT staff was insufficient for the implementation process. McDowell et al. (2017) noted having an increase in the staffing levels during the implementation phase as well as having more trained superusers could improve efficiency and workflow. P1 noted "With the implementation of the EHR came a significant increase in the IT staff." P5 also indicated, "...the first thing that we did was we hired a set of IT business analysts, and they were all tasks to head up a particular module." P2 also explained, "Additional staff

was needed because in order to make it work, you had to have those positions in place.”

P4 indicated

...we had to create the positions for the analysts...A lot of additional staff and it was a higher level of staff...There was the IS tech, an administrator for the software and permissions...But then we had to get all these analysts. We had to have an analyst for RadNet, PathNet, PharmNet, and CareNet...and it was just this massive staff that had to be hired.

Although staffing levels played a crucial role in the success of the implementation process, the increase in staffing levels required to facilitate the various phases and processes of the EHR implementation affected the cost of the implementation. P4 emphasized the cost implication, noting, “The whole implementation was very pricey, because the product was pricy.”

The data revealed the selection of the staff included a focus on expertise. The participants noted selection of the staff, in particular, the database analysts and super users, were based on the staff's expertise and knowledge of their department and/or clinical practice. Lopez et al. (2018) identified factors contributing to successful training such as including trainers who are practicing providers and thus familiar with work flow demands. Staff were reassigned from their practice area to work with the IT team during the build and implementation phase. The database analysts were assigned to the various modules and sections of the records; for example, analysts were assigned to nursing services, radiology department, physician services, and the laboratory department. Reassigning staff from current practice area could pose a challenge for the staffing levels



of the organization because of the requirement for backfilling the deficit areas as a result of the reassignment of staff.

Previous research showed EHR implementation project's staff who provide direct patient care are usually pulled from their area of practice because of their experience and knowledge, requiring alternative coverage to backfill the clinical shifts, which contributes to increase costs and potential disruption of continuity of care (Bullard, 2016). P5 noted,

...the super users were basically taken out of the day to day activities. So, they had to be backfilled, but that was for a short period of time, a six-month period, a fixed period of time. What we did was hire locums and pay overtime and that sort of thing to backfill them while they did these additional duties.

However, the differences in the requirement and documentation for the various services required the individual assignment of the analysts to each clinical as well as non-clinical area. Therefore, reassigning staff with the expertise in the practice area to participate in the EHR implementation seems critical to the success of the process. P3 described the variation in the documentation for each clinician noting,

What we did was to consider each staff member group separately. What I mean is that because physician's documentation is different from that of nurses and nurses maybe different from the EMS...we thought it best to have persons grouped according to their needs.

P6 also explained,

But the reality is, there was crossover between all the wards, and you know, they all talk to each other. So, that's a significant challenge. And again, putting the

right human resources in place, people with the actual skilled knowledge of how to run a lab, how radiology works, because they came out of those departments.

We couldn't have succeeded without that...and...you can't really even import that skill set, it really has to come within your organization, because each one is a little bit different. So that was that critical.

The findings revealed the diversity of the specialized staffing requirements corroborating the complexity of the health care environment in terms of individual players and the complex workflows and how these players interact with each other. CAS such as health care organizations consists of multiple players involved in health care delivery including doctors, nurses, patients, and insurers with co-evolution occurring when individuals adapt to changes in the larger environment (Mason et al., 2017). Understanding the diversity and interdependency of the individual agents and the effect each agent may have on outcomes is a starting point for identifying the complexity of the health care environment (Begun & Thygeson, 2015). Barrett (2018) argued lack of support from individual players could impede the successful implementation of the EHR system.

## **Theme 2: Monitoring**

All participants addressed the monitoring and evaluation of usage and security of the EHR system at several levels including performance of audits to determine usage, unauthorized access to patient files, compliance, maintenance of confidentiality, as well as the broader issue of security such as cyber security. Participants emphasized the high level of priority given to having a monitoring process in place to promote patient safety and confidentiality. Daly (2016) emphasized the importance of monitoring the use of the

system noting one of the success factors of EHR implementation includes putting quality managers and nurses in charge of examining documentation practices to ensure accurate representation of patient care and monitoring of the use of the system by randomly selecting records for review. Sittig et al. (2018) also noted monitoring of local user activities facilitate improvement in system usability.

Sligo et al. (2017) noted implementing HIS such as EHR is complex and requires transformation of the organizational culture. The ability of individual agents to self-organize in CAS can lead to emergence of new behaviors and norms (Khan et al., 2018). Thus, monitoring of the use of the system to ensure negative behaviors that could jeopardize patient safety and the delivery of care plays a key role in the implementation process. Participants described processes for security including in built footprint and firewalls. P6 noted,

... it's because health care being what it is, you know, requiring confidentiality, security of data, the system was already built around roles...each individual within the organization was essentially identified by role...Username and password unlock the door for some people and not for others, you define that in your role-based security, but much more significantly, was the electronic auditing of who's even looked at something.

P3 also explained “Once you open the notes in the EHR system, a paper trail or a footprint is left there... [and] a relationship must be established as to why you went into the notes.” P1 explained, “...every physician was provided with a unique identifier, a unique number or passwords, so that for each person accessing the EHR is accessing it

through a password. And so, every access to the EHR is recorded, recordable, and retrievable.” P2 also indicated, “We focused a lot on ensuring that persons knew that the system had an inbuilt footprint...That was one of the things to make sure that patients’ confidentiality was protected.”

Additionally, P4 noted,

To support user compliance, we did audits and managers were charged with double checking documentation. Just all hands-on deck to monitor documentation was probably the greatest strategy, the audits and monitoring...[and] on a larger scale, IT monitor intrusion into the system. But that's broader, IT is looking at attacks from the outside, cyber security.

A review of policy and procedure documents indicated significant emphasis on security and access and corroborated the data obtained from the participants as noted in the example below:

...appropriately track and log User access by assigning a unique User identifier, outline the requirements for granting access rights, and establish termination procedures for those rights...Usernames will be created only after IT is notified in writing...No one should enter a record on behalf of another person unless his or her job description would also give him or her privilege to view that information...Each user is only to view what they need to see to do their job...Audits of chart access should be done on a monthly basis to determine if unauthorized access is taking place.

The findings reflected the current evidence regarding the importance of confidentiality and protection of patient data, a standard practice in health care requiring a high degree of compliance. Babrahem and Monowar (2018) noted health care organizations should ensure a high level of confidentiality of patient records and is a standard requirement for the development of the EHR system. The findings showed significant emphasis on the data protection and confidentiality as evidenced in the processes and policies included in the EHR implementation process.

#### **Theme 4: Identifying Organizational Gaps**

Another important element in the implementation process relates to identifying the needs of the organization, in particular, identifying the training needs as well as the resources required for the successful implementation of the EHR system. In the review of the document, the project plan indicated the events related to identifying organizational gaps and include event deliveries such as “Complete...questionnaires. Schedule calls with...and...project-specific teams to review gaps/questionnaires. Determine training requirements for any new...team members. Review millennium design decisions for impact of process changes.” The participants unanimously indicated identifying organizational gaps as a critical step in the initial planning phase of the EHR implementation process.

All participants indicated the challenges regarding the variation of computer skills and experience among the staff, in particular typing skills. P1 explained,

The gaps were identified. Some staff had been exposed to EHR before where others had not been exposed. Some staff had experience with typing and the use

of computers, whereas other staff had less exposure. So there had to be an identification of where the gaps were.

P3 described the variation in the documentation for each clinician noting, “We thought it best to have persons grouped according to their needs. By so doing, we were able to sort of encouraged and get more buy-in from the staff to get the EHR initiated.” P3 also indicated, “We had doctors identified from different specialties to bring their requirements. I thought that was useful in developing the program to suit our needs. [Also], I think from the physician point of view including myself...we don't know typing at all. Additionally, P5 noted, “In addition to training the staff on the modules...we had to really assess each individual as to where they were at with the computer skills because before that time it was only pen and paper.”

Participants also described the need for increased resources including not only the human resources but, infrastructure such as the hardware and software required for the implementation of the EHR system noting the implementation was a complete change from paper-based to electronic-based documentation. A review of the project plan document indicated a significant emphasis on the implementation of the hardware and software including the purchasing, delivery, set up, testing, connectivity and performance of the various infrastructure. The EHR implementation process was considered a complete change from a paper-based system to an electronic-based system requiring not only an increased in human resources, but also the additional technical infrastructure such as computers, servers, and helpdesk services. P4 noted,

The other strategy that we had to look at was around hardware, because we didn't have hardware. So, there was a big push to get computers, to actually purchase the hardware that we needed throughout the organization, and then we had to put in place the infrastructure. So, we had to build the material resources, the actual IT resources, servers, computers, everything around that. So, there was physical resources as an IT resource. Then you have your backup resources around your servers, and the server room.

P6 also described the requirements as it relates to the infrastructure noting,

There's a huge amount of hardware implementation because, we had a lot of equipment that was set up to support the system in the server room, but then there was a whole fleet of new equipment to give to the end users to actually interact with the system. So, we had a whole tech team focused on how many portable machines we're [going to] need, how many fix workstations. I mean, ...we were putting computers in places that they've never been before.

The data indicated, in considering an EHR implementation, careful planning and identification of the organizational needs was relevant for successful implementation.

The various parts must align for the system to function fully and interface with each other as the new organizational norms emerged with the use of a new system. Individuals in a CAS interact and self-organize and emerge as an interdependent complex system (Welsh, 2014). The complexity of the health care environment necessitates conforming to new changes and individuals operating in these complex systems transform through adaptation (Khan et al., 2018). Bushelle-Edghill et al. (2017) emphasized the challenges of

implementing a new IT system into an already complex health care system and the effect on efficiency and also noted cost as a primary determinant for EHR implementation. Fritz et al. (2015) determined that successful implementation of the EHR system depends on the functionality of the system, the organizational structure and support of the EHR system, and the availability of the technical infrastructure. However, Fritz et al. noted financing, although an important factor, was not a major criterion, which might be due to donor funding.

Cost was identified by most of the participants as a contributing factor for successful implementation and was a barrier to full implementation of the system as most of the participants indicated the EHR system was implemented in a modular format with additional modules implemented over time. However, several participants indicated there was full executive and governmental support for the implementation of the EHR system. Therefore, once the decision was made for the planned implementation phase, cost was not a significant deterrent to the implementation process as the initial phase of the EHR implementation system was funded by the government. P6 explained, “We were fortunate that there was a very strong mandate at the... most senior levels that this was going to get done...very fortunate to have such a strong buy-in from, not only...a senior management level but from a ministerial level.”

### **Theme 5: Time**

The participants recognized time as an essential component in the EHR implementation process and the importance of developing a timeline for the various phases of the EHR implementation as well as managing the agreed timeline to meet the



deadline for the go-live date. Muinga et al. (2018) emphasized the importance of careful planning and management of new technology such as the EHR implementation in complex organizations like hospitals. P1 referred to the management of timeline and developing an “implementation schedule [and] a sort of a strategic mapping of what were the most essential components of the EHR that needed to be implemented and at what time.” Participants referred to having timeline in place for the build of the system, testing and retesting of the product, and the training of the staff. P6 noted, “Putting in the time to design and build within the framework was critical...it wasn't just people, it was also...time to do the build process...If you don't build that into your timeline, you're not likely to succeed.” Khan et al. (2018) highlighted the importance of leaders functioning in a complex environment to ensure adequate time, space, and resources to facilitate successful EHR implementation.

Having a project implementation plan was critical, which included having a checklist of tasks with scheduled implementation timeline. P2 indicated “They actually had specific time setup for various sections of the record...As we came closer to the implementation, they had timeline set up so that each section was ready for the implementation.” Yen et al. (2017) highlighted some of the challenges associated with the evaluative processes of EHR implementation success in a complex environment noting variable trajectories and implementation plans and timelines could impede the successful implementation of EHR. The review of the organizational documents revealed a project plan with timelines indicating the various phases of the implementation plan with initial launch dates and completion dates as well as the expected duration of each

phase and percentage completion. Example, the project and technical planning had a duration of 170 days and the hardware development plan showed a duration of 143 days with commencement of the plan occurring 5 months after the initial system set up plan date. P6 also described the relevance of scheduling time for training noting,

I don't know how many classroom hours ended up on that schedule. But it was a case of sit down, do the math and you realize it's going to take six months to train everybody...And if you haven't planned for that in your timeline, again, you're [going to] fail.

Time was considered a challenge and planning for the implementation process a necessary component for the success of the project. P2 noted, “The challenge was time because...when people talk about moving to an EHR you hear how much more efficient it will be and how you capture the information more quickly...But sometimes what isn't factored in is the amount of time.

### **Theme 6: Sensitization**

Sensitization, although a minor theme played a role in the EHR implementation process. Three participants described the importance of sensitization, which included sensitization of both the staff and the public to the benefits of the EHR. P1 discussed sensitization as it relates to staff acceptance and buy-in noting, “once the decision was made, that we're going to be moving to electronic medical records, the sensitization of the staff started...” P5 explained, “All of the staff would have gone through that sensitization training...the hospital wide sensitization was really important.” P1 also indicated,

Prior to...the full implementation, there had to be a number of steps involving training and getting all the stakeholder buy-in. And so, that was one of the crucial aspects of it, where they had to have adequate sensitization of the staff of the need for the change and the need for the fact that there was now going to be a move away from paper to electronic recording and getting the staffs by-in...teaching and re-teaching and sensitizing and re-sensitization of all the staff.

P2 also explained,

When we decided to go to the EHR, what we did first of all was some sensitization sessions to let staff know what this record would look like, how it would look similar to the paper record, how it would look a little bit different, how it would make life a little bit easier.

Additionally, participants acknowledged the significance of not only sensitization of the staff but also sensitization of the public and patients. The sensitization strategy used by the organization included public awareness in the form of press releases to promote public and patient awareness to facilitate patience and understanding of the expectations and nuances that may develop during the EHR implementation process. In a complex system, recognizing the diversity of the agents plays a crucial role in promoting adaptiveness of the EHR system. Flieger (2017) highlighted one of the key elements of the CAS relates to the unique interest of individual agents in the system, noting a more flexible relational approach could promote change. Flieger opined changing the culture of the practice requires reframing of the approach to implementation of the structures through constant conversation, relationship building, and trust. Therefore, sensitizing all

stakeholders through effective communication could contribute to the successful implementation of the EHR system. P5 stated, “We did sensitization to the public, press releases and that sort of thing to sensitize them [of] the benefits of it, and basically, to ask them for their patience and understanding while we did the implementation.”

Sensitization was important especially in regard to the time it took for documentation and the increased time to see patients. The findings revealed one of the main challenges experienced during the implementation process includes the delay in patient turnaround time between visits.

The findings corroborate the literature on the effects of EHR implementation on patient wait time. Vahdat et al. (2018) found changes in processes such as increase documentation time due to the EHR implementation can result in an increase in patient wait time due to the additional time required for documentation. This delay in patient turnover affected the efficiency of the process. The participants unanimously agreed time was a challenge as the end users all had to learn the new systems of documentation and deal with the nuances involved in the EHR implementation process.

### **Theme 7: Vendor Selection**

Vendor selection was another minor theme identified in the EHR implementation but a critical step in the process. The participants considered the selection of the right vendor a crucial element in the EHR implementation process and the vendor played a key role in supporting the implementation of the system. Some of the participants indicated vendor participation from the beginning stage of the EHR implementation process and the selection of the best system for the organization. P1 indicated a Vendor selection

process was conducted to explore and identify the ideal EHR system looking at what was required and what was on the market and selecting what was considered an EHR system that best aligned with the organization's need, as well as one that had proven success rate. Previous research showed organizations achieve the most success with the implementation process when the vendor selection strategy aligns with the organizational strategies and decision-making structure (Ford et al., 2016).

The data showed significant involvement with the vendor during the implementation phase including involvement with the training program and continued technical support. Olayiwola et al. (2016) noted the goals of the vendor and health care organization are more aligned than is recognized. P5 noted, "Once we went through the procurement, what we did was we selected [the vendor], we engage them to basically advise us on the implementation plan. So, they were very involved having been through that a couple of times." P6 also noted, "To some extent, you do rely on the software vendor. You work with the vendor as a starting point for training, because they have obviously...done it before." Although the participants indicated a reliance on the vendor for support and guidance during the implementation process, the participants refer to adhering to the implementation plan and schedule to facilitate successful completion of the EHR system and meeting the set timeline.

The participants also refer to ongoing support from the vendor including continued upgrades as well as implementation of new modules and training. Fletcher and Payne (2017) emphasized the importance of creating a strong relationship between the vendor and the health care organization to support improved quality of care, positive

patient experience, and efficiency. Barrett (2018) noted the complexity of the health care industry continues to increase as health care delivery becomes more patient-centered, and the technology used to facilitate patient care more deterministic in nature. Thus, health care providers and users of the EHR systems maintain an open line of communication with EHR vendors, advising of limitations of the EHR to inform future innovations (Barrett, 2018). Based on the findings, a good vendor-organizational relationship plays a significant role in the success of the EHR implementation and providing support for the maintenance of the system.

### **Applications to Professional Practice**

The findings of this study revealed several strategies health care leaders use to implement the EHR system. The literature review revealed a focus on EHR implementation to reduce health care costs and improve patient safety and outcomes as emphasized by Ford et al. (2016). However, to my knowledge, the literature on EHR implementation in the Caribbean is limited or non-existing. Hospitals in other Caribbean Islands may share similar challenges and concerns experienced in the research organization, which may be different from health care organizations in developed countries such as the United States. The findings from this study may provide information health care leaders in the Caribbean can use to implement the EHR system and could help these leaders identify with the similarities that exist in other Caribbean islands.

The research literature reflected the importance and benefits of implementing an EHR system. Mack et al. (2016) highlighted the benefits of EHR implementation

including efforts to improve access and clinical outcomes such as improved patient safety and quality of care. Heart et al. (2017) also noted health care professionals agreed the benefits of using an EHR system include better medical care and improved patient safety. Gheorghiu and Hagens (2016) highlighted some of the potential benefits of using the EHR including improved quality of care, greater efficiencies, better access to care, and use of the data to inform research. The data corroborated some of the benefits of implementing the EHR including improvement in the accessibility and retrievability of the records across the organization and among providers., and real-time availability of patient information across the organization to inform patient care, which translates into improved care, enhanced patient safety, and continuity of care. The data also showed improvement in documentation and transparency regarding access to patient records, contributing to confidentiality of patient records and staff compliance. Other benefits identified in the data included the reduction in storage due to the decrease in paper documentation requiring less storage space, and the availability of printable patient educational information within the EHR system, easily accessible at each patient encounter. The findings also revealed some challenges in the implementation process.

The data reflected customization of the EHR system for the organization posed some challenges during the implementation process due to the “knock-on effect” of customization in one area on another. Participants also noted the implementation of the EHR system across all departments also posed a challenge as the design, build, and test phase of the system occurred simultaneously across all departments. Additionally, limitations in costs prevented the full implementation of the EHR system at the initial

phase, resulting in a phased implementation of components of the system. However, the data showed mixed perceptions regarding a phased implementation strategy, indicating the phased approach allows the organization to become familiar with the use of the EHR system.

Health care leaders in other Caribbean islands may experience similar challenges and could use the strategies identified in this study for successful implementation of the EHR system in their organization. Further, the findings from this study may help health care organizations in the Caribbean identify the benefits of EHR implementation including improved efficiency of documentation, easy access to patient information, interoperability of patient data, accurate communication among providers, and real-time information which can inform patient care and decision-making. However, organizations should balance the potential benefits with realistic expectations of the challenges of EHR implementation (Crowley, 2019).

### **Implications for Social Change**

The findings of this study could contribute to social change as health care leaders in other clinical settings within the local community as well as other Caribbean islands could use the information to successfully implement the EHR system to promote improvement in the quality of health care provided. The findings of this study are consistent with other research relating to the sharing of patient data. The widespread emphasis on health care focusses on interoperability and sharing of patient information to improve the standards of care provided to promote better patient outcomes and enhance



the decision-making process relating to quality of care for the individual patient as well as public health in general (Gheorghiu & Hagens, 2016; Heart et al., 2017).

The use of an EHR system also facilitates the collaboration of health care facilities in the provision of health care and enhance the patient experience. Sharing of health care data across organizations and departments promotes continuity of care and could reduce the risk of medical errors as health care providers can access the documentation of care by other providers. Additionally, the benefit of coordination of patient care from sharing of patient information could contribute to improve population health (Williams et al., 2017). The EHR also facilitates improvement in the documentation process as health care providers can more accurately and completely document the medical records, thus, contributing to the appropriate diagnosis and treatment of patients (Bjarnadottir et al., 2016).

### **Recommendations for Action**

The findings from this study included several strategies health care leaders may use to successfully implement the EHR system. The themes identified in this study revealed the organization used a structured approach to managing change relating to the EHR implementation process and included having a guided project plan. Health care leaders could use the findings of this study to develop a project plan for EHR implementation to include recognizing the organizational needs as the first step in the process and involving the staff in the implementation process to promote staff buy-in. For organizations opting for a phased approach to implementation, identifying and including staff with the expertise in their field to participate in the build phase of the

implementation process for both the clinical and non-clinical areas could contribute to the success of the implementation process. Additionally, developing an IT support team to provide training and support for end users during the go live and post implementation phase could facilitate a smooth transition from a paper-based system to a fully electronic system. Also, developing a monitoring and evaluation process could promote compliance and ensure patient confidentiality.

Other stakeholders in the health care industry who could benefit from this study include IT leaders and HIT system vendors. The findings of this study could also provide valuable insights to researchers interested in further research in EHR implementation. I will share the findings of this study with the research participants. Additionally, I will disseminate the results through scholarly journals.

### **Recommendations for Further Research**

The complexity of the health care environment can lead to variations in the implementation process of the EHR system. Smaller organizations may experience different degree of challenges in implementing the EHR. Further research can be conducted on the adoption of EHR in the Caribbean to determine the adoption rate of EHR in these jurisdictions as well as barriers that could prevent implementation and strategies to overcome those barriers. Additionally, researchers could explore health care organizations in the Caribbean that have experience with the use of the system to compare the adoption rate of EHR across the region and determine the effectiveness of the use of the EHR system in these jurisdictions as well as providers attitudes towards the use of the EHR system. Also, based on the findings relating to the implementation in a

phased format, further research could determine the advantages and disadvantages of a phased implementation versus a full implementation process.

As outlined in Section 1, the limitations identified in this study included the sample size of the study and limited availability of health care leaders involved in the EHR implementation process. A small sample size could limit the generalizability of the research findings. Researchers could consider exploring the topic through the lens of health care leaders from other organizations to promote generalizability of the data. Another limitation identified during the data collection process relates to the elapsed time since the implementation of the EHR system at the research organization. As noted in the reflective journal, some participants visibly expressed a lapse in recall of the information. However, triangulation of the data through a review of the documents corroborate the research findings and promote credibility of the study results.

### **Reflections**

As a health care professional with over 20 years of experience in the industry, I had concerns about injecting personal biases during the data collection process. As a result, I consciously reflected on my thoughts during the process. However, during the interview sessions, I realized my experience was limited to that of the end user of the EHR system and not at the strategic planning and decision-making level, which enabled a deeper level of questioning to gain a richer understanding of the strategies health care leaders use to successfully implement the EHR system.

Another reflection is that I did not anticipate the challenges in gaining access to a research partner, which created some delay in the process. I realized as a student, a

flexible approach to the process is critical to progressing and moving forward. The desire to succeed superseded the feeling of disappointment. I also reflected on the infringement on the participant's time because as a health care leader I understand the challenges of balancing all the daily workflow in a health care environment. So, expressing understanding and patience and allowing participants to determine the time and location is important. Overall, I enjoyed the data collection process and the participants expressed a willingness to share their knowledge and participate in this process.

### **Conclusion**

The concern for improved patient safety and health outcomes, as well as the reduction in health care costs remains the driver for the implementation of the EHR system. The adoption rate continues to grow supported by incentives from government organizations. However, challenges still exist, preventing the full implementation of the EHR system. While health care providers and practitioners realized the benefits of using the EHR to promote the interoperability of the system and improve patient safety and outcomes, the evidence is inconclusive regarding the reduction in health care cost. However, the findings of this study showed overall patient care and outcomes remain a primary focus of implementing an EHR system.

The themes emerging from this research revealed health care leaders recognized the value of the end users in the overall success of the EHR implementation process. Providing training for end users and identifying and developing staff with the expertise in their individual role to function in an IT capacity as database analysts and superusers during the implementation process is a critical success strategy that promotes staff

engagement in the process. Also, maintaining the vendor-organizational relationship ensures continued support in the use of the system. Additionally, health care leaders place great emphasis on implementing strategies to maintain patient confidentiality and privacy as EHR use poses significant challenges and concerns for breach of confidentiality. The use of EHR is evolving and research should continue to determine the full benefit of using the EHR system to promote continued improvement in the delivery of health care and the reduction in health care costs. Implementing strategies to support the changes necessary in implementing a new technology such as the EHR in a complex health care environment requires careful planning and execution to promote success.

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## Appendix A: Interview Protocol

### **Overview of the research**

The purpose of this qualitative single case study is to explore strategies health care leaders use to implement EHR systems to reduce health care costs. The implication of the study includes the potential to provide new insight to hospital leaders who need to implement the EHR system while contributing to the opportunity for increased efficiency and promoting better patient outcomes. Achieving better patient outcomes could improve the overall population health, foster a healthier workforce, and contribute to the reduction in health care costs.

### **Research Question**

What strategies do health care leaders use in successfully implementing EHR systems?

### **Data collection procedures**

- I will assign a code to identify participants instead names to ensure protection confidentiality of participants' information.
- I will I will collect data using face-to-face semistructured interviews and document reviews.
- I will use reflective journaling to promote open-ended interview questions to facilitate a deeper understanding of the EHR implementation process.
- The research partner organization will not be named in the final research manuscript.

- I will not use participants' personal information for any purpose outside of this research project.
- Electronic data will be kept secure on a password protected computer and written documents will be stored in a locked file cabinet accessible only by myself.
- The data will be kept for a period of at least 5 years, as required by Walden's Institutional Review Board.

**Data analysis**

- I will transcribe the interview recordings, cross checking the audio for accuracy; and reviewing the data collected from the written reports and protocols.
- A member checking method will be used to verify the accuracy of the data findings in which participants will be asked to review the transcribed data to verify the correctness of the information the participants provided.
- Data will be analyzed using the NVivo computer software to identify recurring themes.
- I will develop a coding scheme based on the identified themes and organize the data utilizing the NVivo software.

## Appendix B: Interview Questions

1. What strategies did you use to successfully implement the EHR system?
2. What strategies did you use in identifying staff training needs and developing staff training programs to promote successful implementation of your EHR system?
3. What strategic role did the information technology (IT) staff played in the successful implementation of your EHR program?
4. What strategies did you use during the EHR implementation process to support user compliance with the change in the documentation requirements for the EHR system?
5. What strategic measures did you include during the implementation process to ensure patient safety and confidentiality in the use of your EHR system?
6. What are some of the challenges or barriers you encountered during the implementation of the strategies and processes of the EHR system?
7. How do you assess the effectiveness of the strategies for implementing your EHR system?